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February 27, 2009

Ms. Sandra Brunelli
Remediation Division, Bureau of Water Protection and Land Reuse
Connecticut Department of Environmental Protection
79 Elm Street
Hartford, CT 06106-5127

Subject: **Ecological Risk Assessment**
Arch Chemical, Inc Property at 350 Knotter Drive, Cheshire, CT
EPA ID No. CTD98016799

Dear Ms. Brunelli,

On behalf of Arch Chemical, Inc (Arch), in July 2008 AECOM (formerly ENSR) submitted to the Connecticut Department of Environmental Protection (CTDEP) an addendum to the April 2007 Screening Level Ecological Risk Assessment (SLERA) Work Plan (WP) for the facility located at 350 Knotter Driver in Cheshire, CT. On November 5, 2008 CTDEP provided comments to Arch requesting additional information prior to the collection of soil samples for the SLERA. The responses to CTDEP's comments and the requested information are provided in the following attachments.

In addition, as requested, the RCRA environmental indicator forms for human health and the groundwater migration have been completed and are also attached.

Please do not hesitate to contact Christine Archer at 603-528-8912 if you have any questions about the responses or the attachments. We look forward to receiving CTDEP's approval of the Quality Assurance Project Plan (QAPP) and conducting surface soil sampling in the spring.

Yours sincerely,

Christine Archer

David F. Mitchell

Christine Archer
Technical Specialist - Ecological Risk Assessment
christine.archer@aecom.com

Dr. David Mitchell
Senior Ecological Risk Assessor
Dave.F.Mitchell@aecom.com

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ATTACHMENT A

RESPONSE TO CTDEP COMMENTS DATED NOVEMBER 5, 2008

Comment 1: *One action item identified in the December 2007 CTDEP/EPA comment letter and discussed during the March 20, 2008, conference call, was to obtain more data on the chemicals used at the facility, both before and after it was acquired by Arch in 1983. The facility was occupied by Siemens, a medical equipment manufacturing company, from its construction in 1975 until 1983. Arch did not find any information on specific manufacturing activities or chemical usage at the facility before 1983. The Work Plan Addendum reported that Contaminants of Potential Ecological Concern (COPECs) associated with the presumed medical manufacturing activities include Volatile Organic Compounds (VOCs), Semi-Volatile Organic Compounds (SVOCs), metals, and petroleum hydrocarbons. Arch noted that these COPECs were analyzed during the Transfer Act investigation, and will be included as part of the proposed surface soil sampling program.*

The lack of specific information on manufacturing processes and chemical usage before 1983 makes it a challenge to identify specific contaminant classes. However, the proposed suite of soil analyses seems appropriate to support the Screening Level Ecological Risk Assessment (SLERA). Please develop a Quality Assurance Project Plan (QAPP) prior to data collection. In the QAPP, please compare reporting limits to conservative eco risk-based screening values for each constituent to ensure that reporting limits are below screening values. Any contaminant with a reporting limit above the appropriate screening level would have to be retained as a Contaminant of Potential Environmental Concern (COPEC) for evaluation in a Baseline Ecological Risk Assessment (BERA).

As eco risk-based screening values are not available for petroleum hydrocarbons, it is recommended to focus the analyses on Polycyclic Aromatic Hydrocarbons (PAHs) instead, for which some soil benchmarks are available.

Response:

A QAPP has been developed for the surface soil sampling plan and is included as Attachment B. As described in the QAPP, fourteen surface soil samples (0 to 2 foot horizon) will be analyzed for metals, volatile organic compounds (VOCs), and semi-volatile organic compounds (SVOCs), in accordance with CT Reasonable Confidence Protocols (CT RCPs). Consideration was also given to including extractable total petroleum hydrocarbons (ETPH) in the QAPP as that parameter had been included in prior investigations under the Connecticut Transfer Act. However, this analysis provides data on a range of hydrocarbons, and as noted by the CTDEP comment above, no single ecological risk based screening value can reasonably be applied to the result. The SVOC analysis will provide compound specific data that will be adequate to provide SLERA data for the range of compounds included in the ETPH analysis. Therefore, ETPH will not be included in the surface soil sampling program. The QAPP provides a comparison of analytical reporting limits to ecological soil screening levels and chemicals with a reporting limit above the associated screening level will be retained in the SLERA.

Comment 2: *The Work Plan Addendum includes portions of the facility's Stormwater Management Plan (SMP), dated November 1, 2000, in Attachment 3. The information is also discussed in Section 2.3 of the Work Plan Addendum. The SMP provided the following information of potential relevance to the future SLERA:*

- *The SMP states that Arch has never used the undeveloped portion of the property for industrial, waste storage, or waste disposal purposes.*
- *Certain driveway areas at the Site are subject to the General Permit because trucks access the facility along this driveway to deliver hazardous materials and remove wastes from the Site.*
- *The remaining driveways, parking lots, and other paved areas are curbed. Stormwater runoff from these surfaces is directed via the curbing to three catch basins which discharge to an un-named stream flowing along the northern edge of the property.*

- *All chemical storage is indoors. Loading and unloading of chemicals occurs within an enclosed loading dock. Trucks back up to the dock and unload directly into the building. The potential for these chemicals to come in contact with stormwater is low.*
- *Stacks on the roof of the facility vent various pieces of laboratory equipment. The SMP deems it unlikely that fumes from these stacks would impact stormwater runoff from the roof because of the small amounts of materials released by these structures.*
- *Waste is not disposed at the facility. All chemical wastes generated in the individual laboratories is double-packed in drums and stored outside in the hazardous waste storage building. Existing waste handling procedures virtually eliminate the possibility of contact between hazardous wastes and stormwater. The SMP indicates (in 2000) that the hazardous waste storage building is slated for closure.*
- *No spills or leaks of hazardous substances have occurred in quantities above five gallons at Olin or Arch since October 1, 1993.*
- *The SMP determined that there are no known non-stormwater discharges from the facility. In addition, all floor drains and sinks in the facility discharge to the sanitary sewer system.*
- *The stormwater runoff from the property is collected at least once per year during a storm event and analyzed for a number of parameters, of which the following may be of interest to risk management decision making:*
  - *Total copper, lead, and zinc*
  - *48 hr LC_{50} (aquatic toxicity) [species not specified]*

The available information suggests that there is little chance of finding spill- or disposal-related chemicals associated with the facility in Site surface water. Surface water sampling may be needed if EPA or CT DEP determines that the existence of a stormwater permit does not preclude the need to ensure that surface water flowing from the facility is acceptable to downstream aquatic receptors. Please provide recent annual stormwater monitoring reports, including results of aquatic toxicity evaluations and the concentrations of select heavy metals in runoff from the facility. This information may be helpful for assessing the need to collect surface water samples.

Response:

The results of the last stormwater monitoring event and a letter noting that the general permit has been revoked are provided in Attachment C.

Comment 3: *Section 3 of the Work Plan Addendum describes the proposed surface (0-2 ft deep) soil sampling and evaluation program for the Site. Figure 2 in the Addendum shows the approximate sampling locations. The proposed soil sampling program to the east of the facility building will generate three new soil samples. This number appears small given the number and type of potential release areas in this part of the property. Please double the number of soil samples collected to the east of the facility building to cover potential release areas better or justify the number and location of samples proposed based on the potential for releases to surface soil in these areas. As a third alternative, any previously collected surface soil samples (0-2 ft deep) from this area could be considered in the SLERA, provided analyses were performed for the appropriate suites of constituents and reporting limits were below eco risk-based soil screening values.*

Response:

An additional three surface soil samples will be collected to the east of the facility building to provide better coverage of potential release areas. This brings the total number of proposed soil samples to 14. A revised version of Figure 2 from the Work Plan Addendum is included at the end of this attachment. The sampling locations within this figure are approximate and will be finalized in the field.

Comment 4: *Page 3-2, Section 3.2 of the Work Plan Addendum notes that The Ecological Receptor Exposure Pathway Scoping Checklist (included as Attachment 5 to the Work Plan Addendum) will be completed as part of the Screening Level Ecological Risk Assessment (SLERA) in order to document potentially relevant ecological exposure pathways at the site. While it is not a requirement that Arch complete the scoping checklist, it is strongly recommended. The checklist can be a useful tool to determine whether the potential exists for complete exposure pathways between RCRA facility contaminants and ecological receptors and to focus the ecological risk assessment on any potential exposure pathways identified. For that reason, if the scoping checklist is used, it should be completed and provided to EPA and CT DEP before development of the SLERA to focus future discussions between the agencies and Arch on the scope of the SLERA.*

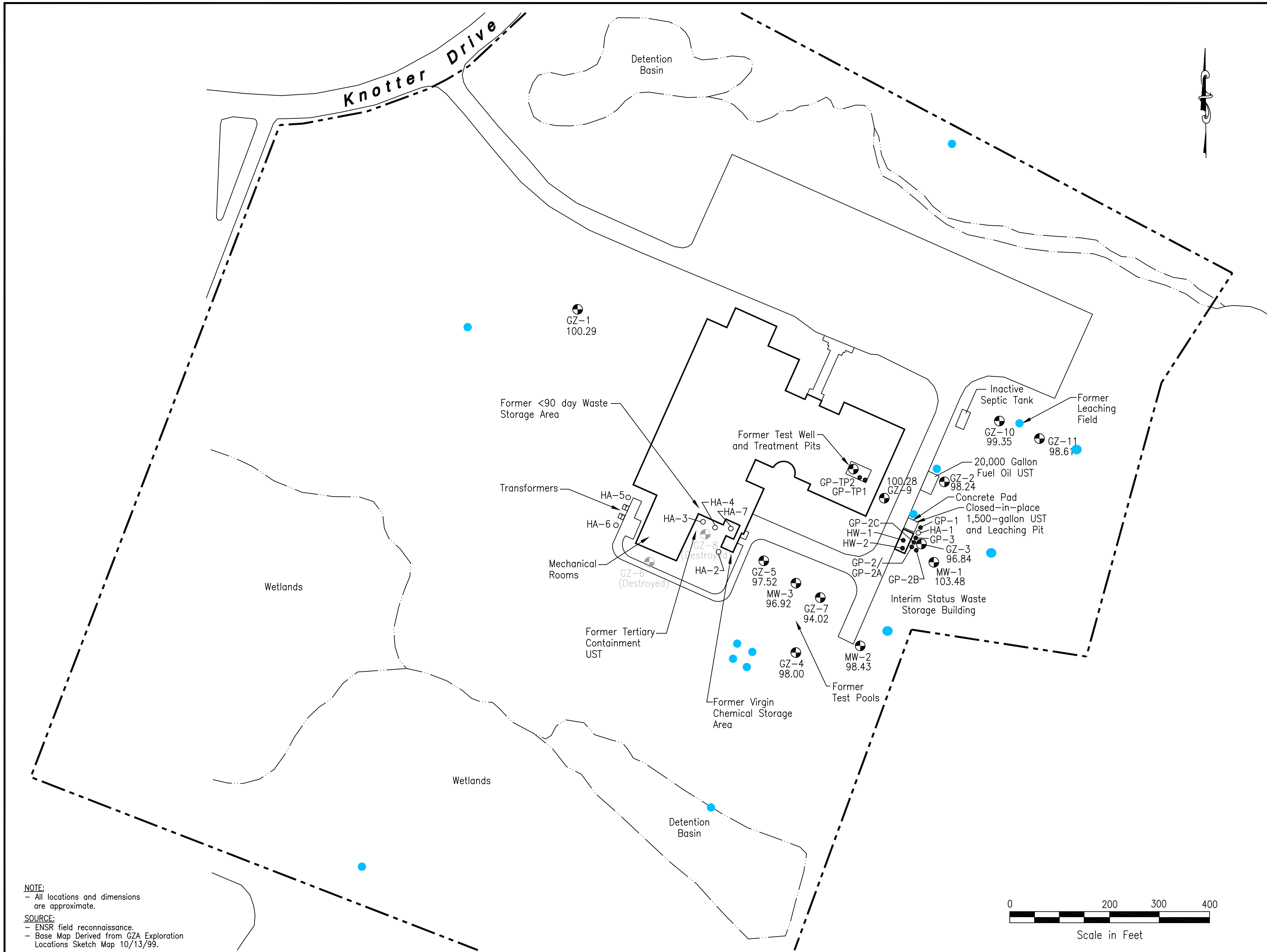
Response:

The Ecological Receptor Exposure Pathway Scoping Checklist has been completed and is provided in Attachment D.

Comment 5: *During our March 20, 2008 conference call with ENSR, EPA and CT DEP agreed to consider surface soil data collected from potential Site release areas and information on historical activities and stormwater management at the Site in assessing the need for surface water and sediment sampling. In addition, EPA and CT DEP requested additional information on the nature of the outflows from the two detention basins on the Site to the Ten Mile Brook (see General Comment 4 in December 5, 2007 letter from CT DEP). In its January 21, 2008 response, ENSR agreed to provide additional information on the hydrology and status of the two detention areas at the Site as part of the site ecological characterization. Addressing this general issue in the SLERA would be appropriate. However, it would expedite the process to provide the information in advance. Please include photographs of settings and habitats at the Site to help visualize these settings and support risk management decision making.*

Response:

A site visit is planned in order to visually assess the two detention ponds; particularly with regard to stormwater inputs. A brief memo will be provided to CTDEP to provide photographs of the ponds and the surrounding areas and additional information regarding the hydrology and status of the detention ponds. It is anticipated that this site visit will occur when the snow melts and the ponds and associated drainage pathways become more visible.



NOTE:
- All locations and dimensions are approximate.

SOURCE:
- ENSR field reconnaissance.
- Base Map Derived from GZA Exploration Locations Sketch Map 10/13/99.

LEGEND:

- Approximate Property Boundary
- GZ-9 100.28 — Monitoring Well/Soil Boring with Well Head Elevation (installed by GZA, 1999)
- GP-1 HW-1 — Geoprobe Location
- MW-1 — Monitoring Well/Soil Boring with Well Head Elevation (installed by ENSR, 2001)
- HA-1 — Shallow Hand Auger Sample
- Proposed Soil Sampling Location

Sampling locations are approximate. Final locations will be selected based on observed field conditions.

CLIENT

Arch Chemicals, Inc.
1200 River Road
Charleston, Tennessee 37310

PROJECT TITLE

Arch Chemicals, Inc.
350 Knotter Drive
Cheshire, Connecticut

FIGURE TITLE

Site Plan

APPROVED BY	REVIEWED BY
DRAWN BY: G. Moquin	SCALE: 1" = 200'
JOB NUMBER: 0489-004	DATE: February 2004

ENSR
2 Technology Park
Westford, Massachusetts
(978) 589-3000

Figure 2

SHEET

C:\04890058.DWG

ATTACHMENT B

QUALITY ASSURANCE PROJECT PLAN

AECOM

Quality Assurance Project Plan

RCRA Closure
Arch Chemicals, Inc., Cheshire, CT

RCRA Closure
at Arch Chemicals, Inc.
350 Knotter Drive
Cheshire, CT 06410

EPA ID No. 980916779

Prepared By: Tori Hubenich Date: 2/25/09

Approved By: Marie Wojtas Date: 2/25/09
Technical Reviewer

Quality Assurance Project Plan
RCRA Closure
Arch Chemicals, Inc., Cheshire, CT

Distribution list

CTDEP Project Manager, Sandra Brunelli
Arch Chemicals, Inc. Project Manager, Gayle Taylor
AECOM Project Manager, Michelle Snyder, CHMM
AECOM Senior Project Manager, Lawrence M. Hogan, PG, LSP, LEP
AECOM Project QA Officer, Lori Herberich
AECOM Field Team Leader, Sean Beaudry
Alpha Analytical Project Manager, Gina Bartolomeo

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A.0 Project management

A.1 Introduction

This Quality Assurance Project Plan (QAPP) presents the organization, objectives, planned activities, and specific quality assurance/quality control (QA/QC) procedures associated with the Resource Conservation and Recovery Act (RCRA) Closure activities to be conducted at the Arch Chemicals, Inc. (Arch) facility in Cheshire, Connecticut. The closure activities consist of a surface soil sampling program to obtain data to determine if the surface soil has been impacted by facility operations. This data will be used to complete a Screening Level Ecological Risk Assessment (SLERA) in support of site closure under RCRA. The facility formerly contained an Interim Waste Storage (IWS) Unit for which clean closure was completed in 2005. Arch operated this regulated unit under “interim status” as provided by 22a-449(c)-105 of the Regulations of Connecticut State Agencies and Section 3005 of RCRA. The collection of the surface soil data and completion of the SLERA, will provide the necessary data to evaluate whether the RCRA Closure for the entire facility can be documented or if additional work will be needed to accomplish this objective.

Specific protocols for sampling, sample handling and storage, chain-of-custody, and laboratory and field analyses will be described. This QAPP has been prepared by AECOM, formerly ENSR, in accordance with the U.S. EPA QAPP policy as presented in EPA Requirements for Quality Assurance Project Plans (EPA QA/R-5, March 2001). Additional guidance used in preparing this QAPP is presented in Section A.10.

A.2 Project schedule

Surface soil sampling is expected to begin in the spring of 2009 following the thawing of the surface soil horizon. Laboratory analysis is expected to take no more than 28 days. The Ecological Risk Assessment Report will be submitted within six months following receipt of the last laboratory deliverable.

A.3 Distribution list

The QAPP, and any subsequent revisions, will be distributed to the personnel shown on the Distribution List that immediately follows the approval page.

A.4 Project/ task organization

The responsibilities of key personnel are described below.

A.4.1 Management responsibilities

<u>CTDEP project manager</u>

The CTDEP Project Manager, Ms. Sandra Brunelli, has the overall responsibility for all phases of the project.

<u>Arch Chemicals Inc. project manager</u>

The Arch Chemicals Inc. Project Manager, Ms. Gayle Taylor, will represent Arch for this project and will review all documents before submission to the agencies.

<u>AECOM project managers</u>

The AECOM Senior Project Manager, Mr. Lawrence M. Hogan, has responsibility for technical and scheduling matters. Mr. Hogan will be supported by Ms. Michelle Snyder, the AECOM Project Manager.

Other duties, as necessary, of the AECOM Project Managers include:

- Subcontractor procurement,
- Assignment of duties to project staff and orientation of the staff to the specific needs and requirements of the project,
- Ensuring that data assessment activities are conducted in accordance with the QAPP,
- Approval of project-specific procedures and internally prepared plans, drawings, and reports,
- Serving as the focus for coordination of all field and laboratory task activities, communications, reports, and technical reviews, and other support functions, and facilitating site activities with the technical requirements of the project, and
- Maintenance of the project files.

A.4.2 Quality assurance responsibilities

<u>AECOM project QA officer</u>

The AECOM Project QA Officer, Ms. Lori Herberich, has overall responsibility for quality assurance oversight. The AECOM Project QA Officer communicates directly to the AECOM Project Manager. Specific responsibilities include:

- Preparing the QAPP,
- Reviewing and approving QA procedures, including any modifications to existing approved procedures,
- Ensuring that QA audits of the various phases of the project are conducted as required,
- Providing QA technical assistance to project staff,
- Ensuring that data validation/data assessment is conducted in accordance with the QAPP, and
- Reporting on the adequacy, status, and effectiveness of the QA program to the AECOM Project Manager.

A.4.3 Laboratory responsibilities

Alpha Analytical in Westborough, MA will perform the analyses of all samples.

Laboratory manager

The Laboratory Manager is ultimately responsible for the data produced by the laboratory. Specific responsibilities include:

- Implementing and adhering to the laboratory QA manual and all corporate policies and procedures within the laboratory,
- Approving the standard operating procedures (SOPs),
- Maintaining adequate staffing documented on organization charts, and
- Implementing internal/external audit findings corrective actions.

Laboratory QA coordinator

The Laboratory QA Coordinator reports to the Laboratory Manager. Specific responsibilities include:

- Approving SOPs,
- Assessing and maintaining the laboratory QA manual implementation within the facility operations,
- Recommending resolutions for ongoing or recurrent nonconformances within the laboratory,
- Performing QA assessments, and
- Reviewing and approving corrective action plans for nonconformances, tracking trends of nonconformances to detect systematic problems, and initiating additional corrective actions as needed.

Laboratory project manager

The Laboratory Project Manager, Ms. Gina Bartolomeo, is the primary point of contact between the laboratory and AECOM. Specific responsibilities of the Laboratory Project Manager include:

- Monitoring analytical and QA project requirements for a specified project,
- Acting as a liaison between the client and the laboratory staff,
- Reviewing project data packages for completeness and compliance to client needs, and
- Monitoring, reviewing, and evaluating the progress and performance of projects.

A.4.4 Field responsibilities

AECOM field team leader

The AECOM Field Team Leader, Mr. Sean Beaudry, has overall responsibility for completion of all field activities in accordance with the QAPP and is the communication link between AECOM project management and the field team. Specific responsibilities of the AECOM Field Team Leader include:

- Coordinating activities at the site,
- Assigning specific duties to field team members,
- Mobilizing and demobilizing of the field team and subcontractors to and from the site,
- Directing the activities of subcontractors on site,
- Resolving any logistical problems that could potentially hinder field activities, such as equipment malfunctions or availability, personnel conflicts, or weather dependent working conditions, and
- Implementing field QC including issuance and tracking of measurement and test equipment; the proper labeling, handling, storage, shipping, and chain-of-custody procedures used at the time of sampling; and control and collection of all field documentation.

<u>AECOM field staff</u>

The field staff reports directly to the AECOM Field Team Leader, although the Field Team Leader in some cases will be conducting the duties of the field staff listed below. The responsibilities of the field team include:

- Collecting samples, conducting field measurements, and decontaminating equipment according to documented procedures stated in the QAPP,
- Ensuring that field instruments are properly operated, calibrated, and maintained, and that adequate documentation is kept for all instruments,
- Collecting the required QC samples and thoroughly documenting QC sample collection,
- Ensuring that field documentation and data are complete and accurate, and
- Communicating any nonconformance or potential data quality issues to the AECOM Field Team Leader.

A.5 Problem definition and background

The Arch facility is located in the Cheshire Industrial Park in Cheshire, Connecticut. The facility is bordered on three sides by other industrial/commercial properties within the Cheshire Industrial Park and Knotter Drive. The subject site encompasses approximately 75 acres and is occupied by a 144,700 square foot building. The majority of the building is one story in height with small two story sections and is constructed of concrete block on a slab foundation. Approximately 45 acres is occupied by the building footprint, lawns, parking lot and service roads. The balance of the property, approximately 30 acres, is occupied by undeveloped wetlands, ponds, and wooded areas.

The site is located in an area where groundwater is classified by the Connecticut Department of Environmental Protection (CTDEP) as “GB”, indicating that it is considered degraded and is not suitable for human consumption without treatment. The facility is serviced by public water, sanitary sewer, electric and natural gas utilities. The facility boilers are fueled by both fuel oil and natural gas. One 20,000-gallon underground storage tank (UST) containing #2 fuel oil is located east of the site building, near the boiler room. This fuel oil UST was installed in 1993 as a replacement for a similarly sized tank that was installed in 1975.

A.5.1 Site background and description

A.5.1.1 Physical setting

The site is set in a valley area at an elevation of approximately 150 feet above mean sea level). Subsurface investigations have demonstrated that the site is underlain by interbedded fine sand, silt, and clay which in turn is underlain by silt and clay at a depth of approximately 10 to 14 feet.

These observations are consistent with the regional Surficial Geologic Materials Map of Connecticut that describes the surface deposits beneath the site as:

Composed of well sorted thin layers of alternating silt and clay or thicker layers of very fine sand and silt. Very fine sand commonly occurs at the surface and grades downward into rhythmically bedded silt and clay varves (lake-bottom deposits) (Stone et, al 1992).

The bedrock beneath the site is mapped as the New Haven Arkose. Bedrock refusal was not encountered on site, nor have any bedrock outcrops been identified on the site.

A.5.1.2 Potential receptor survey

As mentioned above, the site is located in an area that is mapped as GB. The surficial geology on-site is consistent with this designation as the water yielding properties of the deposits observed and mapped are poor. Nevertheless, ENSR contacted the Chesprocott Health District (serving the towns of Cheshire, Prospect and Wolcott, Connecticut) to ascertain whether there was any known use of water within the site area. Based on the information provided, there are no documented uses of groundwater within the vicinity of the site.

ENSR conducted a 1/2-mile radius well survey for the subject property. Prior to reviewing private well files at the Chesprocott Health District, ENSR visited the Cheshire Assessor's Office in order to develop a list of properties that are located within ½-mile of the subject property. Approximately 300 properties are located within ½-mile of the subject property. A map at the Chesprocott Health District indicated that a majority of the properties were supplied with municipal water. Files for the remaining properties were then reviewed by ENSR. The Chesprocott Health District did not maintain files prior to 1976; therefore information prior to 1976 was not available.

ENSR also conducted a windshield survey of the properties within approximately 500-feet of the subject property. No visual evidence of additional water supply wells were observed during the windshield survey.

A.5.1.3 Site operations and updated site inspection

Arch was created in February 1999 as a separate entity comprising the former specialty chemicals division of Olin Chemicals, Inc. (Olin). Arch/Olin has used the facility as a research and development (R&D) laboratory facility throughout their occupation of the site. On July 25, 2003, ENSR visited the site to inspect the facility and to confirm that site operations had not significantly changed. R&D work conducted by Arch/Olin concentrated on swimming pool chemicals, surfactants, liquid toners, urethane compounds, and biocide compounds. Project-specific specialty chemicals (e.g., propellants for explosives) have also been the subjects of R&D at the facility. A portion of the facility is currently leased to another tenant, Alexion Pharmaceuticals, Inc (Alexion). Alexion is a biopharmaceutical company committed to developing a novel class of anti-inflammatory compounds, known as complement inhibitors.

Wastewater from the R&D laboratories operated by both Arch and Alexion is discharged to the sanitary sewer via separate discharge lines. The Arch R&D laboratory operation discharges their wastewater under CTDEP's "General Permit for Miscellaneous Discharges of Sewer Compatible (MISC) Wastewater." According to Alexion's Director of Operations and Engineering, Mr. Dan Caron, Alexion submitted a Letter of Intent to CT DEP, dated July 24, 2000, regarding General Discharge Registration due to the non-existent but pending CT DEP General Discharge Permit (a different General Permit than the MISC General Permit that Arch utilizes). To date, CTDEP Permitting, Enforcement & Remediation Division has yet to draft a General Discharge Permit and as such no formal permit is required; however Alexion does maintain its facility under BMP's (Best Management Practices).

A 10,000-gallon underground diversion tank formerly associated with the lab wastewater discharge is present outside the southeastern side of the building. According to both Arch and Alexion personnel, this tank was disconnected from the sanitary sewer line as part of the facility renovation conducted in 2000 when Arch moved to a smaller portion of the facility and before Alexion moved in. Thus, the diversion tank is no longer subject to the potential for receipt of wastewater. Prior to 2000, in the event of a spill, wastewater could be diverted to the tank to prevent discharge to the sanitary sewer. Arch personnel indicated that there was never a need to use this tank.

Chemical wastes from Arch's on-site R&D laboratories are consolidated into 5 to 55-gallon drums and shipped off-site as hazardous waste. The amount generated by any one lab is small; however, the combined volume of waste produced by the formerly more than eighty on-site R&D laboratories formerly rendered Arch a large quantity generator. Arch formerly operated an interim status >90-day hazardous waste storage unit (IWS unit) located in a small building outside the eastern side of the main building. This unit is no longer in use and a Closure Plan Parts 1 to 3 were submitted to the CTDEP pursuant to RCRA guidance. The result of these submittals was that the IWS achieved clean closure in 2005.

In addition, a <90-day waste storage room was present in the south side of the site building. This room was constructed such that its entire floor functioned as secondary containment and drip pans were placed beneath all containers. The room also had a drain that led to an outside UST that functioned as tertiary containment. According to Arch personnel, this tertiary containment UST was never used and was removed in 1993. No soil or groundwater samples were reported to have been collected upon removal of this tank. However, the area of the former tertiary containment UST was evaluated as part of Transfer Act investigations. A virgin chemical storage room was also located in the southern side of the building. Arch has no record of a spill from this room. The area around the virgin chemical storage room was also evaluated during the Transfer Act investigations.

As part of the site redevelopment, a new <90-day waste storage area was constructed on the west side of the site building and was used by Arch beginning in January 2001. ENSR inspected this area on July 25, 2003. All wastes currently generated on-site are stored in the new <90-day storage area. This entire room is constructed to function as secondary containment. In addition, containment pans are present beneath the drums and containers in the room. An additional secondary containment device used for catching any spills while pouring contents of small containers into larger containers is located in the <90-day storage area. Bulk storage of virgin chemicals is also located in the new less than <90-day storage area. Bench top quantities are used and stored in the laboratories. No staining, cracks or leaks were observed in the <90-day storage area during an inspection conducted by ENSR in 2003.

A grassy area located to the south of the facility was formerly used as a test area for swimming pool chemicals. The test area consisted of several above ground swimming pools. According to Arch personnel, the pools were used by employees as part of the testing procedure to provide normal biological loading to the water.

GZA Geoenvironmental Inc. (GZA) performed Phase I and Phase II assessments of the facility in 1999 through 2000. GZA reported that chiller condensate and non-contact cooling water were formerly directed to a floor drain in the mechanical room. From 1984 to 1988 this drain discharged water to a drainage ditch located to the southeast of the facility. Approximately 4,000-gallons per day for approximately 150 days per year were discharged to Ten Mile River through this ditch; first under a CT NPDES permit and later as Minor Non-Contact Cooling Water. The water was reported to contain zinc at a concentration of 0.5 mg/L, chlorine, and phosphonate. Floor drains in laboratory areas were sealed when Olin purchased the facility in 1983. GZA evaluated this outfall as part of their Phase II investigations

In 2000, Alexion moved its corporate headquarters to the portion of the building vacated by Arch. Part of the Alexion headquarters is used for research and & development (R&D) laboratories. As a result, Alexion maintains status as a conditionally exempt small quantity generator indicating that they generate less than or equal to 100 kg of hazardous waste per month, accumulate no more than 1000 kg on site at any one time and no more than 100 kg of waste, soil, debris or residue that contains no more than 1 kg of "acute hazardous waste". Alexion does not conduct manufacturing at the facility. Their pilot manufacturing plant, currently producing pharmaceuticals for clinical trials is located in New Haven, Connecticut. According to Mr. Caron, Alexion waste consists primarily of small quantities of spent organic solvent associated with high-pressure liquid chromatography (HPLC), flammables (alcohols), some toxic compounds and used oil associated with vacuum pump operations. The used oil is not considered a hazardous waste. Alexion's waste storage room is located adjacent to Arch's former <90-day water storage room. Acid and base wastes are neutralized and discharged under BMP to the sanitary sewer.

During their tenancy at the building, Alexion has not had a reportable spill of any virgin or waste chemicals. However, one event occurred in February 2001 when a chemical was noted within the pH adjustment system. During this event, the sump overflowed and a turpentine-like odor was observed. Alexion notified CTDEP; however, sample analysis proved that the material on the water that overflowed the sump was turpentine used in cleaning and the event was not considered a chemical spill because it was contained within the pH adjustment system. In addition, the overflow was confined to the system's secondary containment and nothing was released to the environment.

Arch's operations formerly includes a >90-day hazardous waste IWS. The IWS Unit was housed in a 575-square foot concrete and metal building with an eight-foot wide double door. The IWS Unit is on the eastern portion of the property. Wastes stored in the IWS Unit consisted of flammable liquids, acids, alkalis, mercury, and hazardous and non-hazardous solid wastes and liquids. The building is still present; however, it was decontaminated and was documented as a clean closure with no release to the environment identified. Public notice for the clean closure was published on August 3, 2005.

A.5.1.4 Site history

The facility was originally constructed in 1975 and was originally serviced by a private septic system. This system was located to the east of the facility building. An addition was built onto the southwestern portion of the building during 1980 and 1981 and the facility was connected to the municipal sanitary sewer system in 1981. The facility has been used by Arch/Olin since Olin acquired the facility in 1983. The facility was previously occupied by Siemens, a medical equipment manufacturing company, from its construction in 1975 to 1983. No information was available regarding the specific activities performed by Siemens at the facility;

however activities typical of medical equipment manufacturing companies include: metal working, painting, finishing, parts cleaning, and parts assembly. Prior to 1975, the site and surrounding area was under agricultural use.

According to Arch personnel, hydroxyl ammonia nitrate (HAN), a liquid propellant, and hydrazine, a rocket fuel, were used in very small quantities (lab quantities) at the facility. Any waste generated would have been collected for off-site disposal with other hazardous waste generated at the facility. Both HAN and hydrazine were used at the facility from approximately 1984 until 2005. The facility has been connected to the sanitary sewer since 1981; therefore, no discharges of explosive to the environment are expected to have occurred.

Previous environmental reports for the site documented the presence of several historical site features of potential environmental significance that were not related to Arch/Olin site use. These include a “test well” and former treatment pits located within the eastern end of the building as well as a leaching pit and a 1,500-gallon UST of unknown use located to the east of the building. These features were never used by Arch/Olin and their function is unknown; however, the 1,500-gallon UST was closed in place by Olin in 1983 after it was emptied and cleaned. The contents of the UST were characterized as an ignitable organic and were consequently disposed of as hazardous waste. The 1,500-gallon UST and the leaching pit were both located in the vicinity of the facility’s IWS unit, although they are not associated with it in any way.

A.5.2 Problem definition

The objective of the RCRA Closure is to meet the closure performance standards specified in 40 CFR 265.111, which states the following:

"The owner or operator must close the facility in a manner that:

(a) Minimizes the need for further maintenance, and

(b) Controls, minimizes or eliminates, to the extent necessary to protect human health and the environment, post closure escape of hazardous waste, hazardous constitutes, leachate, contaminated run-off, or hazardous waste decomposition products to the ground or surface waters or to the atmosphere, and

(c) Complies with the closure requirements of this part including, but not limited to, the requirements of §§265.197, 265.228, 265.258, 265.280, 265.310, 265.351, 265.404, and 264.1102."

A.6 Project/ task description

To accomplish the above RCRA Closure objectives stated in Section A.1 of this QAPP, the following tasks will be implemented:

- Analyze surface soil samples for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and metals.

Surface soil samples will be collected using a hand auger from locations within the operations area, the former drainage ditch area, the bank where the former drainage ditch is likely to have discharged to the detention basin, and background areas as indicated in Figure 2. A total of 14 soil samples will be collected from the 0 to

2 foot soil horizon in order to better assess potential impacts to ecological receptors due to exposure to constituents in the surface soil.

A.7 Quality objectives and criteria for measurement data

A.7.1 Project quality objectives

The objective is to perform surface soil sampling to determine if the surface soil has been impacted by facility operations. Analytical parameters are presented in Table A-1. The ecological soil screening values that will be used to evaluate the analytical results in the SLERA are also presented in Table A-1.

A.7.2 Data quality objectives for measurement data

Precision

Precision is a measure of the degree to which two or more measurements are in agreement. Field precision is assessed through the collection and measurement of field duplicates at a rate of one duplicate per 10 samples. Precision will be measured through the calculation of relative percent difference (RPD). The objective for field precision RPDs is <50% for solid samples for results reported at greater than 5x the reporting limit.

Precision in the laboratory is assessed through the calculation of RPD for duplicate samples, either as matrix spike/matrix spike duplicates (MS/MSDs) or as laboratory duplicates, depending on the method. Precision control limits for laboratory analyses will be consistent with the laboratory-generated control limits, or with method limits, whichever are more stringent.

Accuracy

Accuracy is the degree of agreement between the observed value and an accepted reference or true value. Accuracy in the field is assessed through trip blank results and the adherence to all sample handling, preservation, and holding time requirements. Sampling preservation and holding time requirements are discussed in Section B.3.1.

Laboratory accuracy is evaluated through the analysis of blanks. Blanks should contain no target analytes above the reporting limits. Laboratory accuracy is also assessed through the analysis of MS/MSDs and laboratory control samples (LCSs), and the subsequent determination of percent recoveries (%Rs). Accuracy control limits will be consistent with the method limits.

Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions. "Normal conditions" are defined as the conditions expected if the sampling plan was implemented as planned.

Field completeness is a measure of the amount of valid samples obtained during all sampling for the project. The field completeness objective is greater than 90 percent.

Laboratory completeness is a measure of the amount of valid measurements obtained from all the measurements taken in the project. The laboratory completeness objective is greater than 95 percent.

Sensitivity

Sensitivity of analytical data is demonstrated by laboratory quantitation limits (QLs). The target QLs for the analytes to be analyzed are presented in Table A-1. These reporting limits for the actual samples may differ due to analytical dilutions, sample volume, or sample matrix. Ecological Soil Screening Levels listed in Table A-1 that are lower than the laboratory quantitation limit for a given analyte are italicized.

Reporting limits were selected in part by consideration of the data quality levels (DQLs) to be achieved and in part by consideration of the actual ability of the laboratory to attain reporting limits at the DQLs.

Comparability

Comparability expresses the confidence with which one data set can be compared to another. Comparability is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the protocols described in the work plans are followed and that proper sampling techniques are used. Planned analytical data will be comparable when similar sampling and analytical methods are used as documented in the QAPP.

Representativeness

Representativeness expresses the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition within a defined spatial and/or temporal boundary.

Representativeness is ensured through the design of the sampling program and will be satisfied by ensuring that the work plans and QAPP are followed and that proper sampling techniques are used. Within the laboratory, representativeness will be ensured by the use of appropriate methods, conformance to the approved analytical procedures, and adherence to sample holding times. The sampling network was designed to provide data representative of the areas of concern. During development of this network, consideration was given to past facility processes, existing analytical data, physical setting and processes, and media of concern.

A.8 Special training/ certification

A.8.1 Training

This investigation includes routine field sampling techniques, field measurements and laboratory analyses. No specialized training is therefore necessary. Prior to starting work, personnel will be given instruction specific to the project, covering the following areas:

- Organization and lines of communication and authority,
- Overview of the scope of work,
- QA/QC requirements,
- Documentation requirements, and

- Health and safety requirements.

Instructions will be provided by the AECOM Project Manager, AECOM Field Team Leader, and AECOM Project QA Officer.

A.8.2 Certifications

Alpha Analytical holds current, applicable certifications for the analyses that will be performed.

A.9 Documents and records

A.9.1 Project files

The project files will be the central repository for all documents which constitute evidence relevant to sampling and analysis activities as described in this QAPP. AECOM is the custodian of the project files and will maintain the contents of the project files for the investigation, including all relevant records, reports, logs, field notebooks, pictures, subcontractor reports, and data reviews in a secured, limited access area and under custody of the AECOM Project Manager.

The project files will include at a minimum:

- Field logbooks,
- Field data and data deliverables,
- Photographs,
- Drawings,
- Sample collection logs,
- Laboratory data deliverables,
- Data validation reports,
- Data assessment reports,
- Access/Legal agreements with property owners,
- A copy of final plans and other documents,
- Progress reports, QA reports, interim project reports, etc.,
- All custody documentation (tags, forms, airbills, etc.)

Records will be retained for 6 years or the duration requested by CTDEP.

A.9.2 Field records

Field logbooks will provide the means of recording the data collecting activities performed during the investigation. As such, entries will be described in as much detail as possible so that persons going to the facility could reconstruct a particular situation without reliance on memory.

Field logbooks will be bound field survey books or notebooks. Logbooks will be assigned to field personnel, but will be stored in the project files when not in use. Each logbook will be identified by the project-specific document number.

The title page of each logbook will contain the following:

- Person to whom the logbook is assigned,
- The logbook number,
- Project name and number,
- Project start date, and
- End date.

Entries into the logbook will contain a variety of information. At the beginning of each entry, the date, start time, weather, names of all sampling team members present, and the signature of the person making the entry will be entered. The names of visitors to the site, field sampling or investigation team personnel, and the purpose of their visit, will also be recorded in the field logbook.

Field logbooks will be supplemented by standardized field measurement and sample collection forms. All measurements made and samples collected will be recorded. All entries will be made in permanent ink, signed, and dated and no erasures or obliterations will be made. If an incorrect entry is made, the information will be crossed out with a single strike mark, which is initialed and dated by the sampler. Whenever a sample is collected, or a measurement is made, a detailed description of the sampling location, which includes compass and distance measurements, or, latitude and longitude information (e.g., obtained by using a global positioning system) will be recorded. The number of photographs taken of the sampling location, if any, will be noted. Equipment used to make measurements will be identified, along with the date of calibration.

A.9.3 Laboratory records and deliverables

Laboratory data reduction procedures will be performed according to the following protocol. All information related to analysis will be documented in controlled laboratory logbooks, instrument printouts, or other approved forms. All entries that are not generated by an automated data system will be made neatly and legibly in permanent, waterproof ink. Information will not be erased or obliterated. Corrections will be made by drawing a single line through the error and entering the correct information adjacent to the cross-out. All changes will be initialed, dated, and, if appropriate, accompanied by a brief explanation. Unused pages or portions of pages will be crossed out to prevent future data entry. Analytical laboratory records will be reviewed by the supervisory personnel on a regular basis, and by the Laboratory QA Coordinator periodically, to verify adherence to documentation requirements.

Data deliverables will be provided within standard turnaround time (not to exceed twenty eight calendar days). The laboratory will provide at least one hard copy report and one copy of an electronic data deliverable (EDD). The EDD will be provided in an Excel format. The hardcopy data packages will conform to the specifications found in the applicable CT Reasonable Confidence Protocols (RCPs).

A.10 References

This QAPP was prepared using the following documents:

ENSR. Ecological Risk Assessment Work Plan Addendum. 350 Knotter Drive, Cheshire, Connecticut July 2008.

Connecticut Department of Environmental Protection (CT DEP) 2006. Guidance for Collecting and Preserving Soil and Sediment Samples for Laboratory Determination of Volatile Organic Compounds. Final. February 28, 2006.

Connecticut Department of Environmental Protection (CTDEP) 2007. Laboratory Quality Assurance and Quality Control Guidance, Reasonable Confidence Protocols Guidance Document. November 2007

United States Environmental Protection Agency, Quality Staff. *EPA Requirements for Quality Assurance Project Plans*, EPA QA/R-5. EPA/240/B-01/003. March 2001.

United States Environmental Protection Agency, Quality Staff. *Guidance on Systematic Planning Using the Data Quality Objectives Process*, EPA QA/G-4. EPA/240/B-06/001. February 2006

United States Environmental Protection Agency, Quality Staff. *EPA Guidance for Quality Assurance Project Plans*, EPA QA/G-5. EPA/240/R-02/009. December 2002.

B.0 Measurement/ data acquisition

B.1 Sampling process design

The rationale for sampling design is provided in the Ecological Risk Assessment Work Plan Addendum (ENSR, 2008).

B.2 Sampling methods

B.2.1 Field measurements

Field measurements will include total VOCs in soil using a photoionization detector (PID).

B.2.2 Sampling procedures

B.2.2.1 Soil

Soil samples will be collected from the 0 to 2 foot horizon using stainless steel hand auger or equivalent technology. All soil samples will be placed in a decontaminated 1+ gallon stainless steel bowl. With the exception of VOC analysis, samples will be homogenized prior to placement in sample containers. The sample containers will be pre-labeled by the AECOM Field Team Leader or his designee at the beginning of each day. Field notebooks and sample collection forms will be used to record pertinent data while sampling. The time of sampling will be recorded on each pre-labeled bottle. All samples will be stored on ice (at 4°C), packed in coolers, and shipped under chain of custody for laboratory analysis.

B.2.3 QC sample collection

QC samples for laboratory analyses will include field duplicates, matrix spike/matrix spike duplicates (MS/MSDs), trip blanks, and temperature blanks. These samples will be collected as described below:

<u>Field duplicates</u>

Field duplicates will be collected a frequency of one field duplicate per 10 samples or less per matrix. Field duplicates will be collected by alternately filling two sets of identical sample containers from the interim container used to collect the sample. All field duplicates will be analyzed for the same parameters as their associated samples.

<u>MS/MSDs</u>

MS/MSD samples will be collected at a frequency of one for every 20 or less investigative samples. For those samples designated as MS/MSDs, sufficient additional volume (based on the laboratory's requirements) will be collected.

Trip blanks

Trip blanks will be included in each shipment of VOC samples. Trip blanks associated with soil samples will be prepared in soil bottles and will contain laboratory deionized water or methanol. Trip blanks will accompany the bottles to the site and will remain (unopened) in the shipping container until the sample bottles are received back at the laboratory. Trip blanks will be analyzed for VOCs only.

Temperature blanks

Temperature blanks will be included in each cooler, allowing the laboratory to determine the temperature of the shipment without disturbing the field samples. Temperature blanks will be prepared in the laboratory by filling a plastic or glass vial with water.

B.2.4 Equipment decontamination

Decontamination of equipment in the field that is not dedicated or disposable will be conducted in general accordance with ENSR SOP 7600 – Decontamination of Field Equipment (provided in Attachment A). The specific equipment decontamination procedures to be used for any non-disposable or non-dedicated sampling equipment are described below.

- Clean equipment with tap water and a laboratory grade non-phosphate detergent; and,
- Rinse thoroughly with tap water;

B.3 Sample handling and custody

B.3.1 Sample containers, preservation, and holding times

Sample bottles and chemical preservatives will be provided by the laboratory. The containers will be cleaned by the manufacturer to meet or exceed all analyte specifications established in the latest U.S. EPA's *Specifications and Guidance for Contaminant-Free Sample Containers*. Certificates of analysis will be provided with each lot of containers and maintained on file to document conformance to EPA specifications.

A summary of sample container, preservation, and holding time requirements is presented in Table B-1.

B.3.2 Sample labeling

Immediately upon collection, each sample will be labeled with an adhesive label. Samples will be assigned unique sample identifications. Each sample label will include the sample number, location, date/time of collection, and analysis. Samples will be assigned unique sample identifications as described below:

- The first two characters will define the matrix type (SS for surface soil)
- The third and fourth characters will be a two digit number that will correspond to a specific location on a map (e.g., 01, 02, 03, etc.)
- The fifth and sixth digits will identify the analysis planned for the sample (SC for soil chemistry)
- The last character of the sample ID will represent the sample type:

1 – Field sample

2 – Field duplicate

3 – Equipment blank

Samples being designated for MS/MSD analysis will not include an identifier as part of the sample code, but will be identified as such on the chain-of-custody form. The sample identification for Trip Blanks (for VOC analysis only) will be "TB" followed by the date (day/month/year).

B.3.3 Custody procedures

Custody is one of several factors that are necessary for the admissibility of environmental data as evidence in a court of law. Custody procedures help to satisfy the two major requirements for admissibility: relevance and authenticity. Sample custody is addressed in two parts: field sample collection and laboratory analysis.

A sample is considered to be under a person's custody if

- the item is in the actual possession of a person;
- the item is in the view of the person after being in actual possession of the person;
- the item was in the actual physical possession of the person but is locked up to prevent tampering;
- the item is in a designated and identified secure area.

Field Custody Procedures

The field sampler is personally responsible for the care and custody of the samples until they are transferred or dispatched properly. Field procedures have been designed such that as few people as possible will handle the samples.

All sample containers will be identified by the use of sample labels with sample numbers, sampling locations, date/time of collection, and type of analysis. Sample labels will be completed for each sample using waterproof ink unless prohibited by weather conditions. For example, a logbook notation would explain that a pencil was used to fill out the sample tag because the pen would not function in freezing weather.

Samples will be accompanied by a properly completed chain-of-custody form. The sample numbers and locations will be listed on the chain-of-custody form. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents the transfer of custody of samples from the sampler to another person, to a mobile laboratory, to the permanent laboratory, or to/from a secure storage location. An example chain-of-custody form is presented as Figure B-1.

All sample shipments will be accompanied by the chain-of-custody record identifying the contents. The original record will accompany the shipment, and the back copy will be retained by the sampler and placed in the project files.

Samples will be properly packaged on ice at 4°C for shipment and dispatched to the laboratory for analysis, with a separate signed custody record enclosed in and secured to the inside top of each sample box or cooler.

Shipping containers will be locked and secured with strapping tape and custody seals for shipment to the laboratory. The custody seals will be attached to the front right and back left of the cooler and covered with clear plastic tape after being signed by field personnel. The cooler will be strapped shut with strapping tape in at least two locations.

If the samples are sent by common carrier, the waybill will be used. Waybills will be retained as part of the permanent documentation. Commercial carriers are not required to sign off on the custody forms since the custody forms will be sealed inside the sample cooler and the custody seals will remain intact.

Laboratory Custody Procedures

Samples will be received and logged in by a designated sample custodian or his/her designee. Upon sample receipt, the sample custodian will

- Examine the shipping containers to verify that the custody tape is intact,
- Examine all sample containers for damage,
- Determine if the temperature required for the requested testing program has been maintained during shipment and document the temperature on the chain-of-custody form or in sample log-in records,
- Compare samples received against those listed on the chain-of-custody,
- Verify that sample holding times have not been exceeded,
- Examine all shipping records for accuracy and completeness,
- Determine sample pH (if applicable) and record on chain-of-custody,
- Sign and date the chain-of-custody immediately (if shipment is accepted) and attach the waybill,
- Note any problems associated with the coolers and/or samples on the cooler receipt form and notify the Laboratory Project Manager, who will be responsible for contacting the client,
- Attach laboratory sample container labels with unique laboratory identification and test, and
- Place the samples in the proper laboratory storage.

Following receipt, samples will be logged in according to the following procedure:

- The samples will be entered into the laboratory information management system (LIMS). At a minimum, the following information will be entered: project name or identification, unique sample numbers (both client and internal laboratory, type of sample, required tests, date and time of laboratory receipt of samples, and field ID provided by field personnel.
- The appropriate laboratory personnel will be notified of sample arrival.
- The completed chain-of-custody, waybills, and any additional documentation will be placed in the project file.

Specific details of laboratory custody procedures for sample receiving, sample identification, sample control, and record retention are described in the Laboratory QA Manual and laboratory SOPs.

B.4 Analytical methods

Samples collected for off-site analysis during the program will be analyzed by

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Samples will be analyzed for the parameters listed in Table A-1. The laboratory analytical methods to be used are summarized in Table B-2. Laboratory turnaround time will not exceed 28 days.

B.5 Quality control

B.5.1 Field

Field QC samples will be collected during surface soil sampling to assess the accuracy and precision of the data. These samples will include field duplicates and trip blanks. The collection of QC samples is described in Section B.2. Frequency of collection and acceptance criteria are described in Section A.7.

B.5.2 Laboratory

The analytical laboratory has a QC program in place to ensure the reliability and validity of the analysis performed at the laboratory. All analytical procedures are documented in writing as SOPs and each SOP includes the minimum requirements for the procedure. The internal QC checks differ slightly for each individual procedure and are outlined in the CT Reasonable Confidence Protocols (CT RCPs). In general they include:

- Blanks (method, reagent/preparation, instrument)
- MS/MSDs
- Surrogate spikes (gas chromatography/mass spectrometry [GC/MS] analysis)
- Laboratory duplicates
- LCSs
- Internal standard areas (gas chromatographic/mass spectrometry (GC/MS) analysis)
- Calibration check compounds
- Interference checks (Inductively Coupled Plasma (ICP) analysis)
- Serial dilutions (ICP analysis)

The CT RCPs for each analysis defines the type, frequency, and corrective action for the applicable QC checks. The control limits for precision and accuracy will be the control limits published in the CT RCPs.

B.6 Instrument/ equipment testing, inspection, and maintenance

The field equipment for this project will include a PID. AECOM field personnel will be responsible for ensuring that the instruments are properly functioning. At a minimum, this will entail checking the instrument prior to shipment to the field and performing daily operational checks and calibration as described in Section B.7. Routine maintenance and trouble-shooting procedures will be performed as described in the manufacturer's instructions. Spare parts will be readily available on site or from the vendor.

Routine testing and preventive maintenance is performed by the laboratory as part of their QA program. Details on the type of checks, frequencies, and corrective actions are included in the Laboratory QA Manual.

B.7 Instrument/ equipment calibration and frequency

The field instrumentation will include a PID. Calibration of the instrument will be performed according to the manufacturer's instrument-specific instructions. Table B-3 details the frequency of calibrations and calibration checks and the calibration acceptance criteria for this instrument. All calibration procedures will be documented in the field records. Calibration records will include the date/time of calibration, name of the person performing the calibration, reference standard used, and the results of the calibration.

Calibration procedures for laboratory instruments will consist of initial calibrations, initial calibration verifications, and continuing calibration verification. The SOP for each analysis performed in the laboratory describes the calibration procedures, their frequency, acceptance criteria, and the conditions that will require recalibration.

The laboratory maintains documentation for each instrument, which includes the following information: instrument identification, serial number, date of calibration, analyst, calibration solutions, and the samples associated with these calibrations.

B.8 Inspection/ acceptance of supplies and consumables

For this project, critical supplies for field activities will be tracked through AECOM's system in the following manner.

Critical Supplies and Consumables	Inspection Requirements and Acceptance Criteria	Responsible Individual
Sample bottles	Visually inspected upon receipt for cracks, breakage, and cleanliness. Must be accompanied by certificate of analysis.	Field Team
Chemicals and reagents	Visually inspected for proper labeling, expiration dates, appropriate grade	Field Team
Field measurement equipment	Functional checks to ensure proper calibration and operating capacity	Field Team
Sampling equipment	Visually inspected for obvious defects, damage, and contamination	Field Team

Supplies and consumables not meeting acceptance criteria will initiate the appropriate corrective action. Corrective measures may include repair or replacement of measurement equipment, and/or notification of vendor and subsequent replacement of defective or inappropriate materials. All actions will be documented in the project files.

The laboratory system of inspection and acceptance of supplies and consumable is documented in the Laboratory QA Manual.

B.9 Non-direct measurements

The use of non-direct data (i.e., historical reports, maps, literature searches) will be limited to the design of the sampling program and will not be used for characterization purposes. The data necessary to meet the objectives specified in Section A.7 of the QAPP will be generated during the investigation and will come from the following sources:

- Field records (sample locations, sample observations)
- Field measurements (PID readings) and
- Analytical results for chemical testing of soil.

The data collected under this QAPP has been designed to be of sufficient quality to meet the program objectives.

B.10 Data management

Data management operations include data recording, validation, transformation, transmittal, reduction, analysis, tracking, storage and retrieval.

Upon receipt from the laboratory, hard copy data and EDDs will be checked for completeness. During the data analysis process, a variety of quality checks are performed to ensure data integrity. These checks include

- Audits to ensure that laboratories reported all requested analyses;
- Checks that all analytes are consistently and correctly identified;
- Reviews to ensure that units of measurement are provided and are consistent;
- Reports to review sample definitions (depths, dates, locations); and
- Proofing manually entered data against the hard-copy original.

Records of the checks are maintained on file.

Once all data quality checks are performed, the data will be exported to a variety of formats to meet project needs. As part of the final report, sample data will be compared to the applicable ecological soil screening values. Cross-tab tables showing concentrations by sample location will be prepared.

The project data will be maintained on a secure network drive, which is backed up regularly. Access to the data will be limited to authorized users and will be controlled by password access. Data will be retained in accordance with the requirements stated in Section A.9.1 of this QAPP.

C.0 Assessment/ oversight

C.1 Assessment and response actions

C.1.1 Assessments

The types of planned assessments pertinent to this program include technical surveillance audits (TSAs) of field and laboratory activities, data package audits, and data validation audits.

Field activity TSA

If requested by the AECOM Project Manager, a TSA of field activities may be conducted by the AECOM Project QA Officer or his/her designate. The TSA includes an examination of field sampling records, field measurement results, field instrument operating and calibration records, sample collection, handling, and packaging procedures, QA procedures, chain-of-custody, sample documentation, etc. If significant deficiencies are noted, follow-up audits will be conducted.

During the audit, the auditor will keep detailed notes of audit findings. Preliminary results of the audit will be reviewed with the AECOM Field Team Leader while on site to ensure that deficiencies adversely affecting data quality are immediately identified and corrective measures initiated. Upon completion of the audit, the AECOM Project QA Officer will prepare a written audit report, which summarizes the audit findings, identifies deficiencies and recommends corrective actions. This report will be submitted to the AECOM Project Manager, who will be responsible for ensuring that corrective measures are implemented and documented (Section C.1.2). The results of the audit process will be included in the QA reports to management, as described in Section C.2.

Laboratory TSA

Laboratory TSAs are conducted periodically by AECOM's QA staff as part of their analytical subcontractor monitoring program. The laboratory TSA includes a review of the following areas:

- QA organization and procedures,
- Personnel training and qualifications,
- Sample log-in procedures,
- Sample storage facilities,
- Analyst technique,
- Adherence to laboratory SOPs and project QAPP,
- Compliance with QA/QC objectives,
- Instrument calibration and maintenance,
- Data recording, reduction, review, and reporting, and
- Cleanliness and housekeeping.

Preliminary results of the systems audit will be discussed with the Laboratory Manager, Laboratory Project Manager, and Laboratory QA Coordinator. A written report that summarizes audit findings and recommends corrective actions will be prepared and submitted to the Laboratory Manager for response, and to the AECOM Project Manager. The results of the audit, including resolution of any deficiencies, will be included in the QA reports to management, as described in Section C.2.

C.1.2 Response actions

Corrective action is the process of identifying, recommending, approving, and implementing measures to counter unacceptable procedures or out-of-limit QC performance that can affect data quality. Corrective action can occur during field activities, laboratory analyses, and data assessment. All corrective action proposed and implemented should be documented in the QA reports to management (Section C.2). Corrective action should only be implemented after approval by the AECOM Project Manager, or his designate.

The CTDEP Project Manager will be notified of significant issues that potentially impact the achievement of the project objectives.

<u>Field corrective action</u>

Corrective action in the field may be needed when the sample network is changed (i.e., more/less samples, sampling locations other than those specified in the QAPP, etc.), or when sampling procedures and/or field analytical procedures require modification, etc. due to unexpected conditions. The field team may identify the need for corrective action. The AECOM Field Team Leader will approve the corrective action and notify the AECOM Project Manager. The AECOM Project Manager, in consultation with the AECOM Project QA Officer, will approve the corrective measure. The AECOM Field Team Leader will ensure that the corrective measure is implemented by the field team.

Corrective action resulting from internal field audits will be implemented immediately if data may be adversely affected due to unapproved or improper use of approved methods. The AECOM Project QA Officer will identify deficiencies and recommend corrective action to the AECOM Project Manager. Implementation of corrective actions will be performed by the AECOM Field Team Leader and field team. Corrective action will be documented in QA reports to the project management team (Section C.2).

Corrective actions will be implemented and documented in the field record book. Documentation will include:

- A description of the circumstances that initiated the corrective action,
- The action taken in response,
- The final resolution, and
- Any necessary approvals.

No staff member will initiate corrective action without prior communication of findings through the proper channels.

Laboratory corrective action

Corrective action in the laboratory may occur prior to, during, and after initial analyses. A number of conditions such as broken sample containers, multiple phases, low/high pH readings, and potentially high concentration samples may be identified during sample log-in or analysis. Following consultation with laboratory analysts and supervisory personnel, it may be necessary for the Laboratory QA Coordinator to approve the implementation of corrective action. If the nonconformance causes project objectives not to be achieved, the AECOM Project Manager will be notified.

These corrective actions are performed prior to release of the data from the laboratory. The corrective action will be documented in both the laboratory's corrective action files, and in the narrative data report sent from the laboratory to the AECOM Project Manager. If the corrective action does not rectify the situation, the laboratory will contact the AECOM Project Manager, who will determine the action to be taken and inform the appropriate personnel.

Corrective action during data review and data assessment

The need for corrective action may be identified during either data review or data assessment. Potential types of corrective action may include resampling by the field team or reinjection/reanalysis of samples by the laboratory. These actions are dependent upon the ability to mobilize the field team and whether the data to be collected is necessary to meet the required QA objectives. If the AECOM data reviewer or data assessor identifies a corrective action situation, the AECOM Project Manager will be responsible for informing the appropriate personnel.

C.2 Reports to management

QA reports will be submitted to the AECOM Project Manager to ensure that any problems identified during the sampling and analysis programs are investigated and the proper corrective measures taken in response. The QA reports will include (where applicable):

- All results of field and laboratory audits,
- A summary of revisions to the QAPP,
- Results of any performance evaluation (PE) or split samples,
- Problems noted during data validation and assessment, and
- Significant QA/QC problems, recommended corrective actions, and the outcome of corrective actions.

QA reports will be prepared by the AECOM Project QA Officer and submitted on an as-needed basis.

D.0 Data validation/ data usability

D.1 Data review, verification, and validation

All data generated through field activities, or through the analytical program, will be reduced, verified and/or and validated prior to reporting. No data will be disseminated by AECOM or its subcontractors until it has been subjected to the procedures summarized below.

D.1.1 Field data

Field data will be reviewed daily by the AECOM Field Team Leader to ensure that the records are complete, accurate, and legible and to verify that the sampling procedures are in accordance with the protocols specified in the Work Plan and QAPP.

D.1.2 Internal laboratory review

Prior to the release of any data from the laboratory, the data will be reviewed and approved by laboratory personnel. The review will consist of a tiered approach that will include reviews by the person performing the work, by a qualified peer, and by supervisory and/or QA personnel.

D.1.3 Validation of analytical data

A limited qualitative validation of the data deliverables will be performed. All QC results specified as a laboratory report deliverable in the RCPs will be reviewed by AECOM's data validation staff. These method-specific QC results typically include method blanks, laboratory control samples, matrix spikes, matrix duplicates, and/or surrogates, and are summarized on QC forms. In addition, the RCPs require that the laboratory include a narrative in the report that details all QC nonconformances that may have occurred during sample shipping, receipt, processing, and analysis. This information will also be reviewed by AECOM's data validation staff and will be evaluated with regard to any potential impacts to the sample data. The QC criteria specified in the RCPs will be used to evaluate the QC information (summarized on forms and detailed in the narrative) during data validation.

D.2 Verification and validation methods

D.2.1 Field data verification

Field records will be reviewed by the AECOM Field Team Leader to ensure that:

- Logbooks and standardized forms have been filled out completely and that the information recorded accurately reflects the activities that were performed.
- Records are legible and in accordance with good recordkeeping practices, i.e., entries are signed and dated, data are not obliterated, changes are initialed, dated, and explained.

- Sample collection, handling, preservation, and storage procedures were conducted in accordance with the protocols described in the QAPP, and that any deviations were documented and approved by the appropriate personnel.
- Field calibration, replicate and duplicate sample results are within acceptable ranges and any deviations were properly documented and approved by the appropriate personnel.

D.2.2 Laboratory data verification

Prior to being released as final, laboratory data will proceed through a tiered review process. Data verification starts with the analyst who performs a 100 percent review of the data to ensure the work was done correctly the first time. The data reduction and initial verification process must ensure that:

- Sample preparation and analysis information is correct and complete,
- Analytical results are correct and complete,
- The appropriate SOPs have been followed and are identified in the project records,
- Proper documentation procedures have been followed, and
- All nonconformances have been documented.

Following the completion of the initial verification by the analyst performing the data reduction, a systematic check of the data will be performed by an experienced peer or supervisor. This check will be performed to ensure that initial review has been completed correctly and thoroughly and will include a review of

- Adherence to the requested analytical method SOP,
- Correct interpretation of chromatograms, mass spectra, etc.,
- Correctness of numerical input when computer programs are used (checked randomly),
- Correct identification and quantification of constituents with appropriate qualifiers,
- Numerical correctness of calculations and formulas (checked randomly)
- Acceptability of QC data,
- Documentation that instruments were operating according to method specifications (calibrations, performance checks, etc.),
- Documentation of dilution factors, standard concentrations, etc.,
- Sample holding time assessment.

A third-level review will be performed by the Laboratory Project Manager before results are submitted to clients. This review serves to verify the completeness of the data report and to ensure that project requirements are met for the analyses performed. A narrative to accompany the final report will be prepared by the Laboratory Project Manager.

D.2.3 Validation of analytical deliverables

Validation of the data will be performed as described in Section D.1.3 of the QAPP using the U.S. EPA *Region I, EPA-NE Data Validation Functional Guidelines for Evaluation of Environmental Analyses* modified for non-Contract Laboratory Program (CLP) methods.

Upon completion of the validation, a report will be prepared. This report will summarize the samples reviewed, elements reviewed, any nonconformances with the established criteria, and validation actions (including application of data qualifiers). Data qualifiers will be consistent with the U.S EPA guidelines.

D.2.4 Verification during data management

All manually entered data (e.g., field data) will be proofed 100 percent against the original. Electronic data will be checked 100 percent after loading against laboratory data sheets for completeness and spot checked for accuracy.

D.3 Reconciliation with user requirements

D.3.1 Comparison to measurement objectives

The field and laboratory data collected during this investigation will be used to achieve the objectives identified in Section A.7 of this QAPP. The QC results associated with each analytical parameter for each matrix will be compared to the measurement objectives presented in Section A.7.2 of this QAPP. Only data generated in association with QC results meeting the stated acceptance criteria (i.e., data determined to be valid) will be considered usable for decision making purposes.

D.3.1.1 Accuracy assessment

One measure of accuracy will be percent recovery (%Rs), which is calculated for matrix spikes, surrogates, and laboratory control samples (LCSs). Percent recoveries for MS/MSD results will be determined according to the following equation:

$$\%R = \frac{(Amount\ in\ Spiked\ Sample - Amount\ in\ Sample)}{Known\ \mathrm{A}mount\ \mathrm{A}dded}\, x\, 100$$

Percent recoveries for surrogates and LCS results will be determined according to the following equation:

$$\%R = \frac{Experimental\ Concentration}{Known\ Amount\ \mathrm{A}dded}\, x\, 100$$

An additional measure of accuracy is blank contamination. The blanks associated with this project include laboratory method blanks and field blanks (e.g., trip blanks). The results of the laboratory and field blanks will be compared to the objectives in stated Section A.7.2 of the QAPP. Failure to meet these objectives may indicate a systematic laboratory or field problem that should be investigated and resolved immediately. Associated data may be qualified and limitations placed on its use, depending on the magnitude of the problem.

D.3.1.2 Precision assessment

The RPD between the matrix spike and matrix spike duplicate and field duplicate pair is calculated to compare to precision objectives (Section A.7.2 of this QAPP). The RPD will be calculated according to the following formula.

$$RPD = \frac{(Amount\ in\ Sample\,1 - Amount\ in\ Sample\ 2)}{0.5\,(Amount\ in\ Sample\,1 + Amount\ in\ Sample\ 2)}\,x\,100$$

Failure to achieve precision objectives may result in the associated data being qualified (Section D.2.3) and limitations placed upon its use.

D.3.1.3 Completeness assessment

Completeness is the ratio of the number of valid sample results to the total number of samples analyzed with a specific matrix and/or analysis. Following completion of the analytical testing, the percent completeness will be calculated by the following equation:

$$Completeness = \frac{(number\ of\ \ valid\ \ measurements)}{(number\ of\ \ measurements\ \ planned)}\,x\,100$$

Failure to meet the completeness objective will require an assessment to determine if the missing or invalid data are critical to achieving the project objectives. Corrective actions may include resampling or re-analysis, depending on the type of problem, logistical constraints, etc.

D.3.2 Comparison to project objectives

In addition to the comparison described in Section D.3.1, the data obtained will be both qualitatively and quantitatively assessed on a project-wide, matrix-specific, and parameter-specific basis. Factors to be considered in this assessment of field and laboratory data will include, but not necessarily be limited to, the following.

- Conformance to the field methodologies and SOPs proposed in the Work Plan and QAPP,
- Conformance to the analytical methodologies provided in the QAPP,
- Adherence to proposed sampling strategy,
- Presence of elevated detection limits due to matrix interferences or contaminants present at high concentrations,
- Unusable data sets (qualified as “R”) based on data validation,
- Data sets identified as usable for limited purposes (qualified as “J”) based on data validation,
- Effect of qualifiers applied as a result of data review on the ability to implement the project decision rules, and
- Status of all issues requiring corrective action, as presented in the QA reports to management.

The effect of nonconformance (procedures or requirements) or noncompliant data on project objectives will be evaluated. Minor deviations from approved field and laboratory procedures and sampling approach will likely not affect the adequacy of the data as a whole in meeting the project objectives. The assessment will also entail the identification of any remaining data gaps and need to reevaluate project decision rules.

This assessment will be performed by the AECOM technical team, in conjunction with the AECOM Project QA Officer, and the results presented and discussed in detail in the final report.

Figure B-1. Example of chain of custody form

AECOM

CHAIN OF CUSTODY RECORD

Page ____ of ____

Client/Project Name:	**Project Location:**		**Analysis Requested**
Project Number:	**Field Logbook No.:**		
Sampler (Print Name)/(Affiliation):	**Chain of Custody Tape Nos.:**		
Signature:	**Send Results/Report to:**	**TAT:**	

Container Type
P – Plastic
A – Amber Glass
G – Clear Glass
V – VOA Vial
O – Other
E – Encore

Preservation
1 – HCl, 4°
2 – H2SO4, 4°
3 – HNO3, 4°
4 – NaOH, 4°
5 – NaOH/ZnAc, 4°
6 – Na2S2O3, 4°
7 – 4°

Matrix Codes:
DW – Drinking Water
WW – Wastewater
GW – Groundwater
SW – Surface Water
ST – Storm Water
W – Water
S – Soil
SL – Sludge
SD – Sediment
SO – Solid
A – Air
L – Liquid
P – Product

Field Sample No./Identification	Date	Time	COMP	GRAB	Sample Container (Size/Mat'l)	Matrix	Preserv.	Field Filtered											Lab I.D.	Remarks

Relinquished by: (Print Name)/(Affiliation) **Signature:**	**Date:** **Time:**	**Received by:** (Print Name)/(Affiliation) **Signature:**	**Date:** **Time:**	**Analytical Laboratory (Destination):**
Relinquished by: (Print Name)/(Affiliation) **Signature:**	**Date:** **Time:**	**Received by:** (Print Name)/(Affiliation) **Signature:**	**Date:** **Time:**	
Relinquished by: (Print Name)/(Affiliation) **Signature:**	**Date:** **Time:**	**Received by:** (Print Name)/(Affiliation) **Signature:**	**Date:** **Time:**	**Sample Shipped Via:** UPS FedEx Courier Other **Temp blank** Yes No

Q:\GRAPHICS\FORMS\Chain of Custody (COC)\Chain of Custody_AECOM Environment_09.doc

Serial No. ____________

Table A-1. Analyte lists and reporting limits

Parameter	Ecological Soil Screening Level	Laboratory Reporting Limit* (µg/Kg)	
VOCs			
		Low Level(1)	**High Level (2)**
Acetone	2500 [c]	10	500
Acrylonitrile	23.9 [c]	10	200
Benzene	50 [b]	1.0	50.0
Bromobenzene	--	5.0	250
Bromodichloromethane	540 [c]	1.0	50.0
Bromoform	15900 [c]	4.0	200
Bromomethane	235 [c]	2.0	100
Carbon disulfide	94.1 [c]	10	500
Carbon tetrachloride	1000000 [b]	1.0	50.0
Chlorobenzene	50 [b]	1.0	50.0
Chlorodibromomethane	--	1.0	50.0
Chloroethane	--	2.0	100
Chloroform	1190 [c]	1.5	75.0
Chloromethane	10400 [c]	5.0	250
cis-1,2-Dichloroethene	--	1.0	50.0
cis-1,3-Dichloropropene	398 [c]	1.0	50.0
Dibromomethane	--	10	500
Dichlorodifluoromethane	39500 [c]	10	500
Ethyl benzene	50 [b]	1.0	50.0
Hexachlorobutadiene	39.8 [c]	5.0	250
Isopropylbenzene	--	1.0	50.0
Methylene chloride	4050 [c]	10	500
Methyl-tert-butyl ether	--	2.0	100
Naphthalene	100 [b]	5.0	250
n-Butylbenzene	--	1.0	50.0
n-Propylbenzene	--	1.0	50.0
o-Xylene	50 [b]	2.0	100
p/m-Xylene	50 [b]	2.0	100

Parameter	Ecological Soil Screening Level	Laboratory Reporting Limit* (µg/Kg)	
		Low Level (1)	High Level (2)
p-Isopropyltoluene	--	1.0	50.0
sec-Butylbenzene	--	1.0	50.0
Styrene	100 [b]	2.0	100
tert-Butylbenzene	--	5.0	250
Tetrachloroethene	10 [b]	1.0	50.0
Tetrahydrofuran	100 [b]	20	1000
Toluene	50 [b]	1.5	75.0
trans-1,2-Dichloroethene	784 [c]	1.5	75.0
trans-1,3-Dichloropropene	398 [c]	1.0	50.0
Trichloroethene	12400 [c]	1.0	50.0
Trichlorofluoromethane	16400 [c]	5.0	250
Vinyl chloride	10 [b]	2.0	100
1,1-Dichloroethane	20100 [c]	1.5	75.0
1,1-Dichloroethene	8280 [c]	1.0	50.0
1,1-Dichloropropene	--	5.0	250
1,1,1-Trichloroethane	29800 [c]	1.0	50.0
1,1,2-Trichloroethane	28600 [c]	1.5	75.0
1,1,1,2-Tetrachloroethane	225000 [c]	1.0	50.0
1,1,2,2-Tetrachloroethane	127 [c]	1.0	50.0
1,2-Dibromo-3-chloropropane	35.2 [c]	5.0	250
1,2-Dibromoethane	1230 [c]	4.0	200
1,2-Dichlorobenzene	2960 [c]	5.0	250
1,2-Dichloroethane	400 [b]	1.0	50.0
1,2-Dichloropropane	700000 [b]	3.5	180
1,2,3-Trichloropropane	3360 [c]	10	500
1,3-Dichlorobenzene	37700 [c]	5.0	250
1,3-Dichloropropane	--	5.0	250
1,4-Dichlorobenzene	546 [c]	5.0	250
2-Butanone	--	10	500
2-Chlorotoluene	--	5.0	250
2,2-Dichloropropane	--	10	250

Parameter	Ecological Soil Screening Level	Laboratory Reporting Limit* (µg/Kg)	
		Low Level (1)	High Level (2)
4-Chlorotoluene	--	5.0	250
4-Methyl-2-pentanone	443000 [c]	10.0	500
2-Hexanone	12600 [c]	10.0	500
1,2,3-Trichlorobenzene	--	5.0	250
1,2,4-Trichlorobenzene	11100 [c]	5.0	250
1,3,5-Trimethylbenzene	--	5.0	250
1,2,4-Trimethylbenzene	--	5.0	250
trans-1,4-Dichloro-2-butene	--	5.0	250
Freon 113	--	4.0	200
SVOCs			
1,2,4-Trichlorobenzene	11100 [c]	333	
2,4,5-Trichlorophenol	4000 [b]	333	
2,4,6-Trichlorophenol	10000 [b]	333	
2,4-Dichlorophenol	87500 [c]	670	
2,4-Dimethylphenol	*10 [c]*	333	
2,4-Dinitrophenol	20000 [b]	1300	
2,4-Dinitrotoluene	1280 [c]	333	
2,6-Dinitrotoluene	*32.8 [c]*	333	
2-Chloronaphthalene	*12.2 [c]*	400/13**	
2-Chlorophenol	*243 [c]*	400	
2-Methylnaphthalene	3240 [c]	333/13**	
2-Methylphenol	40400 [c]	400	
2-Nitroaniline	74100 [c]	333	
2-Nitrophenol	1600 [c]	1300	
3,3'-Dichlorobenzidine	*646 [c]*	670	
3-Methylphenol/4-Methyphenol	3490 [c]	400	
3-Nitroaniline	3160 [c]	333	
4,6-Dinitro-o-cresol	*144 [c]*	1300	
4-Bromophenyl phenyl ether	--	333	
4-Chloroaniline	1100 [c]	333	
4-Chlorophenyl phenyl ether	--	333	

Parameter	Ecological Soil Screening Level	Laboratory Reporting Limit* (µg/Kg)
4-Nitroaniline	21900 [c]	470
4-Nitrophenol	7000 [b]	670
Acenaphthene	20000 [b]	333/13**
Acenaphthylene	682000 [c]	333/13**
Aniline	*56.8 [c]*	670
Anthracene	100 [b]	333/13**
Benzo(a)anthracene	5210 [c]	333/13**
Benzo(a)pyrene	100 [b]	333/13**
Benzo(b)fluoranthene	59800 [c]	333/13**
Benzo(ghi)perylene	119000 [c]	333/13**
Benzo(k)fluoranthene	148000 [c]	333/13**
Bis(2-chloroethoxy)methane	*302 [c]*	333
Bis(2-chloroethyl)ether	23700 [c]	333
Bis(2-chloroisopropyl)ether	--	333
Bis(2-ethylhexyl)phthalate	925 [c]	670
Butyl benzyl phthalate	*239 [c]*	333
Carbazole	--	333
Chrysene	4730 [c]	333/13**
Dibenzo(a,h)anthracene	18400 [c]	333/13**
Dibenzofuran	--	333
Diethyl phthalate	100000 [b]	333
Dimethyl phthalate	200000 [b]	333
Di-n-butylphthalate	200000 [b]	333
Di-n-octylphthalate	709000 [c]	333
Fluoranthene	100 [b]	333/13**
Fluorene	30000 [b]	333/13**
Hexachlorobenzene	199 [c]	333
Hexachlorobutadiene	39.8 [c]	670
Hexachlorocyclopentadiene	755 [c]	670
Hexachloroethane	596 [c]	333
Indeno(1,2,3-cd)pyrene	109000 [c]	333/13**
Isophorone	139000 [c]	333

Parameter	Ecological Soil Screening Level	Laboratory Reporting Limit* (µg/Kg)
Naphthalene	100 [b]	333/13**
n-Nitrosodiphenylamine	20000 [b]	1000
Nitrobenzene	40000 [b]	333
p-Chloro-m-cresol	7950 [c]	333
Pentachlorophenol	*2 [b]*	1300/53**
Phenanthrene	100 [b]	333/13**
Phenol	*50 [b]*	470
Pyrene	100 [b]	333/13**
Pyridine	*100 [b]*	3300
1,2,4,5,-Tetrachlorobenzene	2020 [c]	1300
Pentachloronitrobenzene	7090 [c]	670
n-Nitrosodi-n-propylamine	544 [c]	330
Metals		
Antimony	78 [a]	2.0 mg/kg
Arsenic	18 [a]	0.4 mg/kg
Barium	330 [a]	0.4 mg/kg
Beryllium	40 [a]	0.2 mg/kg
Cadmium	32 [a]	0.4 mg/kg
Chromium	0.4 [b]	0.4 mg/kg
Copper	70 [a]	0.4 mg/kg
Lead	120 [a]	2.0 mg/kg
Mercury	0.1 [b]	0.08 mg/kg
Nickel	38 [a]	1.0 mg/kg
Selenium	*0.52 [a]*	0.8 mg/kg
Silver	560 [a]	0.4 mg/kg
Thallium	1.0 [b]	0.8 mg/kg
Vanadium	2.0 [b]	0.4 mg/kg
Zinc	120 [a]	2.0 mg/kg

* Further adjusted for sample preparation factors, moisture, and dilutions, where needed.
** Reporting limit for Selected Ion Monitoring
-- Not applicable
(1) Water preserved sample
(2) Methanol preserved sample

Italics indicate Ecological Soil Screening Levels that are lower than the laboratory quantitation limit for a given analyte.
[a] - U.S. EPA Ecological Soil Screening Level. Lower of values for plants and soil invertebrates. Available at http://www.epa.gov/ecotox/ecossl/
[b] - U.S. EPA Region 4 soil screening levels (U.S. EPA, 2001)
[c] - U.S. EPA Region 5 Ecological Screening Levels (ESLs) for soil (U.S. EPA, 2003).

U.S. EPA, 2001. Supplemental Guidance to RAGS, Region 4 Bulletins, Ecological Risk Assessment (Draft), U.S. EPA Region 4 Waste Management Division. http://www.epa.gov/region4/waste/ots/ecolbul.htm.

U.S. EPA, 2003. U.S. EPA Region 5 Ecological Screening Levels. Revision August 2003. Available at: http://www.epa.gov/reg5rcra/ca/edql.htm

Table B-1. Sample container, preservation, and holding time requirements

Parameter	Container [1]	Preservation	Holding Time [2]
Solid Samples			
VOCs	1-40 mL amber vial for methanol preserved; 2-40 mL amber vials for water preserved	Methanol (15 g soil); Water (5 grams/vial) Cool, 4°C	48 hours to freezing for water preserved samples; 14 days from collection to analysis for methanol and water preserved samples
SVOCs	1-8 oz amber glass with Teflon-lined cap	Cool, 4°C.	14 days to extraction and 40 days from extraction to analysis
Metals	1-8 oz amber glass with Teflon-lined cap	Cool, 4°C.	28 days to analysis (mercury); 180 days to analysis (other metals).

[1] Laboratory may provide alternate containers as long as the containers meet the requirements of the method and allow the collection of sufficient volume to perform the analyses and any reanalyses required by the method.
[2] Holding time begins from date of sample collection.

Table B-2. Analytical methodologies

Parameter	Methodology
VOCs	CT RCP 8260
SVOCs	CT RCP 8270 (including SIM)
Metals	CT RCP 6010,7471

Table B-3. Summary of calibration frequency and criteria for field instruments

Analysis	Calibration Frequency	Calibration Standards	Acceptance Criteria
PID	Initial: Each time the instrument is turned on or upon erratic results	Clean ambient air and compressed gas standard (isobutylene at 100ppm)	Within 5% of true value
	Check: Mid and end of the day	Compressed gas standard (isobutylene at 100 ppm)	Within 5% of true value

Attachment A

Standard Operating Procedure for Decontamination of Field Equipment

ENSR

SOP NUMBER: 7600		
Decontamination of Field Equipment	**Date:**	4th Qtr. 1994
	Revision Number:	4
	Author:	Charles Martin
	Discipline:	Geosciences

1.0 PURPOSE AND APPLICABILITY

1.1 Purpose and Applicability

This SOP describes the methods to be used for the decontamination of field equipment used in the collection of environmental samples. The list of field equipment may include a variety of items used in the collection of soil and/or water samples, such as split-spoon samplers, trowels, scoops, spoons, bailers and pumps. Heavy equipment such as drill rigs and backhoes also require decontamination, usually in a specially constructed temporary decontamination area.

Decontamination is performed as a quality assurance measure and a safety precaution. Improperly decontaminated sampling equipment can lead to misinterpretation of environmental data due to interference caused by cross-contamination. Decontamination protects field personnel from potential exposure to hazardous materials. Decontamination also protects the community by preventing transportation of contaminants from a site.

This SOP emphasizes decontamination procedures to be used for decontamination of reusable field equipment. Occasionally, dedicated field equipment such as well construction materials (well screen and riser pipe) or disposable field equipment (bailers or other general sampling implements) may also require decontamination prior to use. The project-specific work plan should indicate the specific decontamination requirements for a particular project.

Respective state or federal agency (regional offices) regulations may require specific types of equipment or procedures for use in decontamination of field equipment. The project manager should review the applicable regulatory requirements, if any, prior to the start of the field investigation program.

1.2 General Principles

Decontamination is accomplished by manually scrubbing, washing, or spraying equipment with detergent solutions, tap water, distilled/deionized water, steam and/or high pressure water, or solvents. The decontamination method and agents are generally determined on a project-specific basis and must be stated in the Quality Assurance Project Plan (QAPP).

Generally, decontamination of equipment is accomplished at each sampling site between collection points. Waste decontamination materials such as spent liquids and solids will be collected and managed as investigation-derived waste for later disposal. All decontamination materials, including wastes, should be stored in a central location so as to maintain control over the quantity of materials used or produced throughout the investigation program.

1.3 Quality Assurance Planning Considerations

1.3.1 General Considerations

Sampling personnel should follow specific quality assurance guidelines as outlined in the site-specific QAPP. The QAPP guidelines typically require collection of equipment blank samples in order to determine the effectiveness of the decontamination procedure.

The decontamination method, solvent, frequency, location on site and the method of containment and disposal of decontamination wash solids and solutions are dependent on site logistics, site-specific chemistry, and nature of the contaminated media to be studied and the objectives of the study. Each topic must be considered and addressed during development of a decontamination strategy and should be outlined in the Quality Assurance Project Plan (QAPP).

1.3.2 Solvent Selection

There are several factors which need to be considered when deciding upon a decontamination solvent. The solvent should not be an analyte of interest. The sampling equipment must be resistant to the solvent. The solvent must be evaporative or water soluble or preferably both. The applicable regulatory agency may have specific requirements regarding decontamination solvents. The QAPP should specify the type of solvent to be used for a particular project.

The analytical objectives of the study must also be considered when deciding upon a decontamination solvent. Pesticide-grade methanol is the solvent of choice for general organic analyses. It is relatively safe and effective. Hexane, acetone, and isopropanol are sometimes used as well. A 10% nitric acid in deionized water solution is the solvent of choice for general metals analyses. Nitric acid can be used only on Teflon, plastics and glass. If used on metal equipment, nitric acid will eventually corrode the metal and lead to the introduction of metals to the collected samples. Dilute hydrochloric acid is usually preferred over nitric acid when cleaning metal sampling equipment.

Equipment decontamination should be performed a safe distance away from the sampling area so as not to interfere with sampling activities but close enough to the sampling area to maintain an efficient working environment. If heavy equipment such as drill rigs or backhoes are to be decontaminated, then a central decontamination station should be constructed with access to a power source and water supply.

1.4 Health and Safety Considerations

Decontamination procedures may involve chemical exposure hazards associated with the type of contaminants encountered or solvents employed and may involve physical hazards associated with decontamination equipment. When decontamination is performed on equipment which has been in contact with hazardous materials or when the quality assurance objectives of the project require decontamination with chemical solvents, the measures necessary to protect personnel must be addressed in the project Health and Safety Plan (HASP). This plan must be approved by the project Health and Safety Officer before work commences, must be distributed to all personnel performing equipment decontamination, and must be adhered to as field activities are performed.

2.0 RESPONSIBILITIES

2.1 Sampling Technician

It is the responsibility of the sampling technician to be familiar with the decontamination procedures outlined within this SOP and with specific quality assurance, and health and safety requirements outlined within project-specific work plans (HASP, QAPP). The sampling technician is responsible for decontamination of field equipment and for proper documentation of decontamination activities. The sampling technician is also responsible for ensuring that decontamination procedures are followed by subcontractors when heavy equipment requires decontamination.

2.2 Field Project Manager

The field project manager is responsible for ensuring that the required decontamination procedures are followed at all times. The project manager is also responsible for ensuring that subcontractors construct and operate their decontamination facilities according to project specifications. The project manager is responsible for collection and control of IDW in accordance with project specifications.

3.0 REQUIRED MATERIALS

- Decontamination agents (per work plan requirements):
    - LIQUI-NOX, ALCONOX, or other phosphate-free biodegradable detergent,
    - Tap water,
    - Distilled/deionized water,
    - Nitric acid and/or hydrochloric acid,
    - Methanol and/or hexane, acetone, isopropanol.
- Health and Safety equipment
- Chemical-free paper towels
- Waste storage containers: drums, 5-gallon pails w/covers, plastic bags
- Cleaning containers: plastic buckets or tubs, galvanized steel pans, pump cleaning cylinder
- Cleaning brushes
- Pressure sprayers
- Squeeze bottles
- Plastic sheeting
- Aluminum foil
- Field project notebook/pen

4.0 METHODS

4.1 General Preparation

4.1.1 It should be assumed that all sampling equipment, even new items, are contaminated until the proper decontamination procedures have been performed on them or unless a certificate of analysis is available which demonstrates the items cleanliness.

Field equipment that is not frequently used should be wrapped in aluminum foil, shiny side out, and stored in a designated "clean" area. Small field equipment can also be stored in plastic bags to eliminate the potential for contamination. Field equipment should be inspected and decontaminated prior to use if the equipment appears contaminated and/or has been stored for long periods of time. Unless customized procedures are stated in the QAPP for decontamination of equipment, the standard procedures specified in this SOP shall be followed.

4.1.2 Establish the decontamination station within an area that is convenient to the sampling location. If single samples will be collected from multiple locations, then a centralized decontamination station, or a portable decontamination station should be established.

4.1.3 An investigation-derived waste (IDW) containment station should be established at this time also. The project-specific work plan should specify the requirements for IDW containment. In general, decontamination solutions are discarded as IDW between sampling locations. Solid waste is disposed of as it is generated.

4.2 Decontamination for Organic Analyses

4.2.1 This procedure applies to soil sampling and groundwater sampling equipment used in the collection of environmental samples submitted for organic constituents analysis. Examples of relevant items of equipment include split-spoons, trowels, scoops/spoons, bailers, and other small items. Submersible pump decontamination procedures are outlined in Section 4.4.

4.2.2 Decontamination is to be performed before sampling events and between sampling points.

4.2.3 After a sample has been collected, remove all gross contamination from the equipment or material by brushing and then rinsing with available tap water.

This initial step may be completed using a 5-gallon pail filled with tap water. Steam or a high-pressure water rinse may also be conducted to remove solids and/or other contamination.

4.2.4 Wash the equipment with a phosphate-free detergent and tap water solution. This solution should be kept in a 5-gallon pail with its own brush.

4.2.5 Rinse with tap water or distilled/deionized water until all detergent and other residue is washed away. This step can be performed over an empty bucket using a squeeze bottle or pressure sprayer.

4.2.6 Rinse with methanol or other appropriate solvent using a squeeze bottle or pressure sprayer. Rinsate should be collected in a waste bucket.

4.2.7 Rerinse with deionized water to remove any residual solvent. Rinsate should be collected in the solvent waste bucket.

4.2.8 Allow the equipment to air-dry in a clean area or blot with chemical-free paper towels before reuse. Wrap the equipment in tin foil and/or seal it in a plastic bag if it will not be reused for a while.

4.2.9 Dispose of soiled materials and spent solutions in the designated IDW disposal containers.

4.3 Decontamination for Inorganic (Metals) Analyses

4.3.1 This procedure applies to soil sampling equipment used primarily in the collection of environmental samples submitted for inorganic constituents analysis. Examples of relevant items of equipment include split-spoons, trowels, scoops/spoons, bailers, and other small items.

4.3.2 For plastic and glass sampling equipment, follow the steps outlined in 4.2 above, however, use a 10% nitric acid solution (acid in water) in place of the solvent rinse in Section 4.2.6.

4.3.3 For metal sampling equipment, follow the steps outlined in 4.2 above, however, use a 10% hydrochloric acid solution (acid in water) in place of the solvent rinse in Section 4.2.6.

4.4 Decontamination of Submersible Pumps

4.4.1 This procedure will be used to decontaminate submersible pumps before and between ground-water sample collection points. This procedure applies to both electric submersible and bladder pumps. This procedure also applies to discharge tubing if it will be reused between sampling points.

4.4.2 Prepare the decontamination area if pump decontamination will be conducted next to the sampling point. If decontamination will occur at another location, the pump and tubing may be removed from the well and placed into a clean trash bag for transport to the decontamination area. Pump decontamination is easier with the use of 3-foot tall pump cleaning cylinders (i.e., Nalgene cylinder) for the various cleaning solutions, although the standard bucket rinse equipment may be used.

4.4.3 Once the decontamination station is established, the pump should be removed from the well and the discharge tubing and power cord coiled by hand as the equipment is removed. If any of the equipment needs to be put down temporarily, place it on a plastic sheet (around well) or in a clean trash bag. If a disposable discharge line is used it should be removed and discarded at this time.

4.4.4 As a first step in the decontamination procedure, use a pressure sprayer with tap water to rinse the exterior of the pump, discharge line, and power cord as necessary. Collect the rinsate and handle as IDW.

4.4.5 Place the pump into a pump cleaning cylinder or bucket containing a detergent solution (detergent in tap water). Holding the tubing/power cord, pump solution through the pump system. A minimum of one gallon of detergent solution should be pumped through the system. Collect the rinsate and handle as IDW.

4.4.6 Place the pump into another cylinder/bucket containing a 10% solution of solvent (methanol, or other designated solvent) in distilled/deionized water. Pump until the detergent solution is removed. Collect the rinsate and handle as IDW.

4.4.7 Place the pump into another cylinder/bucket containing distilled/deionized water. Pump a minimum of 3 to 5 pump system volumes (pump and tubing) of water through the system. Collect the rinsate and handle as IDW.

4.4.8 Remove the pump from the cylinder/bucket and if the pump is reversible, place the pump in the reverse mode to discharge all removable water from the system. If the pump is not reversible the pump and discharge line should be drained by hand as much as possible. Collect the rinsate and handle as IDW.

4.4.9 Using a pressure sprayer with distilled/deionized water, rinse the exterior of the pump, discharge line, and power cord thoroughly, shake all excess water, then place the pump system into a clean trash bag for storage. If the pump system will not be used again right away, the pump itself should also be wrapped with aluminum foil before placing it into the bag.

4.5 Decontamination of Large Equipment

4.5.1 Consult the QAPP for instruction on the location of the decontamination station and the method of containment of the wash solutions. On large projects usually a temporary decontamination facility (decontamination pad) is required which may include a membrane-lined and bermed area large enough to drive heavy equipment (drill rig, backhoe) onto with enough space to spread other equipment and to contain overspray. Usually a small sump with pump is necessary to collect and contain rinsate. A water supply and power source is also necessary to run steam cleaning and/or pressure washing equipment.

4.5.2 Upon arrival and prior to leaving a sampling site, all heavy equipment such as drill rigs, trucks, and backhoes should be thoroughly cleaned and then the parts of the equipment which come in contact or in close proximity to sampling activity should be decontaminated. This can be accomplished in two ways, steam cleaning or high pressure water wash and manual scrubbing. Following this initial cleaning, only those parts of the equipment which come in close proximity to the sampling activities (i.e., auger stems, rods, backhoe bucket) must be decontaminated in between sampling events.

Occasionally, well construction materials such as well screen and riser pipe may require decontamination before the well materials are used. These materials may be washed in the decontamination pad, preferably on a raised surface above the pad (i.e., on sawhorses), with clean plastic draped over the work surfaces. Well materials usually do not require a multistep cleaning process as they generally arrive clean from the manufacturer. Usually, a thorough steam-cleaning of the interior/exterior of the well materials will be sufficient. The QAPP should provide specific guidance regarding decontamination of well materials.

5.0 QUALITY CONTROL

5.1 Field Blank Sample Collection

General guidelines for quality control check of field equipment decontamination usually require the collection of one field blank from the decontaminated equipment per day. The QAPP should specify the type and frequency of collection of each type of quality assurance sample.

Field blanks are generally made by pouring laboratory-supplied deionized water into, over, or through the freshly decontaminated sampling equipment and then transferring this water into a sample container. Field blanks should then be labeled as a sample and submitted to the laboratory to be analyzed for the same parameters as the associated sample. Field blank sample numbers, as well as collection method, time and location should be recorded in the field notebook.

6.0 DOCUMENTATION

Specific information regarding decontamination procedures should be documented in the project-specific field notebook. Documentation within the notebook should thoroughly describe the construction of each decontamination facility and the decontamination steps implemented in order to show compliance with the project work plan. Decontamination events should be logged when they occur with the following information documented:

- Date, time and location of each decontamination event
- Equipment decontaminated
- Method
- Solvents
- Noteable circumstances
- Identification of field blanks and decontamination rinsates
- Method of blank and rinsate collection
- Date, time and location of blank and rinsate collection
- Disposition of IDW

Repetitive decontamination of small items of equipment does not need to be logged each time the item is cleaned.

7.0 TRAINING/QUALIFICATIONS

All sampling technicians performing decontamination must be properly trained in the decontamination procedures employed, the project data quality objectives, health and safety procedures and the project QA procedures. Specific training or orientation will be provided for each project to ensure that personnel understand the special circumstances and requirements of that project. Field personnel should be health and safety certified as specified by OSHA (29 CFR 1910.120(e)(3)(i)) to work on sites where hazardous materials may be present.

8.0 REFERENCES

Not applicable.

ATTACHMENT C

STORMWATER MONITORING REPORT

General Permit for the Discharge of Stormwater Associated with Industrial Activities
STORMWATER MONITORING REPORT

FACILITY INFORMATION

Name (owner, operator): Arch Chemicals, Inc.
Mailing Address: 350 Knotter Dr Cheshire CT 06410
Business Phone: (203) 271 - 4076 Ext. ---- Fax: (203) 271 - 4050
Contact Person: Mr.John Lesky Title: Safety / Environmental Manager
Site Address: 350 Knotter Dr Cheshire CT 06410
Receiving Water (name, basin): Ten Mile River #5202, Quinnipiac Regional Basin
Stormwater G.P. Registration # GSI: 001205 SIC Code: 8731
Check this box if number of employees is 25 or less, or if operated by a municipality: ☐

Sampling Information

Sample Location: North End of Property
Date/Time Collected: 09/26/05 05:00 p.m.
Person Collecting Sample
Storm Magnitude (inches): 0.34" Storm Duration (Hours): 12 hrs
Date of Previous Storm Event: 09/16/05 Rainfall pH: 6.8 s.u.

MONITORING RESULTS:

Parameter	Method	Results (units)	Laboratory
Oil & Grease	EPA 1664	<1.0 mg/L	Analytical Consulting Technology
pH	EPA 150.1	7.50 s.u.	Analytical Consulting Technology
COD	EPA 410.1	<2.0 mg/L	Analytical Consulting Technology
TSS	EPA 160.2	1.00 mg/L	Analytical Consulting Technology
TP	EPA 365.2	1.250 mg/L	Analytical Consulting Technology
TKN	SM4500 Norg	<0.10 mg/L	Analytical Consulting Technology
N03-N	EPA 300	0.19 mg/L	Analytical Consulting Technology
Total Copper	EPA 200.7	<0.01 mg/L	Analytical Consulting Technology
Total Zinc	EPA 200.7	0.054 mg/L	Analytical Consulting Technology
Total Lead	EPA 200.7	<0.02 mg/L	Analytical Consulting Technology
24 Hr LC50	Visual Observation	72.8%	Analytical Consulting Technology
48 Hr LC50	Graphical	69.0%	Analytical Consulting Technology

Attach separate page(s) to report additional parameters monitored pursuant to Part VI.C.1.a of the General Permit.

STATEMENT OF ACKNOWLEDGMENT

I certify that the data reported on this document were prepared under my direction or supervision in accordance with the General Stormwater Permit. The information submitted is, to the best of my knowledge and belief , true, accurate and complete.

Authorized Facility Official:

Signature: D. Cing Date: Nov 30th 2005

STORMWATER ACUTE TOXICITY TEST DATA SHEET

Sample Source: 2005090266-1 ARCH Chemical	
Date/Time Begin: 9/27/05 1700	Date/Time End: 9/29/05 1700
Sample Hardness:3.69 mg/L	Sample Conductivity: 11.9µmho/cm
Test Species:*Daphnia pulex* <24 hrs old	Dilution Water Hardness: 46.0 mg/L

Effluent Dilution	Number Organisms Surviving			Dissolved Oxygen (mg/L)			Temperature (°C)			pH (SU)		
Hours	00	24	48	00	24	48	00	24	48	00	24	48
CONTROL 1	5	4	4	9.2		9.3	20		20	7.3		7.3
CONTROL 2	5	5	5	9.2		9.3	20		20	7.3		7.3
CONTROL 3	5	5	5	9.2		9.3	20		20	7.3		7.3
CONTROL 4	5	5	5	9.2		9.3	20		20	7.3		7.3
6.25% A	5	4	4	9.2		9.2	20		20	7.3		7.3
6.25% B	5	5	5	9.2		9.2	20		20	7.3		7.3
6.25% C	5	5	5	9.2		9.2	20		20	7.3		7.3
6.25% D	5	5	5	9.2		9.2	20		20	7.3		7.3
12.5% A	5	5	5	9.2		9.2	20		20	7.3		7.3
12.5% B	5	5	5	9.2		9.2	20		20	7.3		7.3
12.5% C	5	5	5	9.2		9.2	20		20	7.3		7.3
12.5% D	5	4	4	9.2		9.2	20		20	7.3		7.3
25% A	5	5	5	9.2		9.2	20		20	7.3		7.3
25% B	5	5	5	9.2		9.2	20		20	7.3		7.3
25% C	5	5	5	9.2		9.2	20		20	7.3		7.3
25% D	5	5	5	9.2		9.2	20		20	7.3		7.3
50% A	5	5	5	9.2		9.2	20		20	7.1		7.2
50% B	5	5	5	9.2		9.2	20		20	7.1		7.2
50% C	5	5	5	9.2		9.2	20		20	7.1		7.2
50% D	5	5	4	9.2		9.2	20		20	7.1		7.2
100% A	5	1	0	9.2		9.2	20		20	5.8		6.3
100% B	5	0	0	9.2		9.2	20		20	5.8		6.3
100% C	5	1	0	9.2		9.2	20		20	5.8		6.3
100% D	5	0	0	9.2		9.2	20		20	5.8		6.3

REFERENCE TOXICANT RESULTS

Test Species	Date	Reference Toxicant	Source	LC_{50}
Daphnia pulex	9/27/05	CQC0828	CT-DEP	3.94 ug/l

Please send completed form to:

WATER TOXICS PROGRAM COORDINATOR
CT DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER MANAGEMENT
79 ELM STREET
HARTFORD, CT 06106-5127

ANALYTICAL
CONSULTING
TECHNOLOGY, INC

Certified Laboratory

US EPA CT-021
CT PH-0518
EMail actlabs@sbcglobal.net

168 Railroad Hill St., Waterbury, CT 06708 • (203) 757-3960 • Fax (203) 759-2155
www.actlabs.biz

ARCH Chemicals, Inc.
John Lesky, CIH, CSP
350 Knotter Drive
-0-
Cheshire, CT 06410

Report Date: 02/23/2009

ACT Number: 2005090266 - 1
Sample Type: Grab
Collected by: Client
Location/ID: North End of Property
Description:

Sample Date: 09/26/2005
Sample Time: 17:00:

Date Received: 09/27/2005
Project number
Sample Matrix: Stormwater

Laboratory Test	**Result**	**Units**	**Method**	**Analysis Date**	**Analyst**
Aq. Toxicity					
Aquatic Toxicity Screening\ACT	Attached		22a-430	09/29/2005 04:00:00 PM	RT
Inorganic					
Chemical Oxygen Demand	<2.0	mg/L	EPA 410.1	10/04/2005 10:30:00 AM	JS
Nitrate Nitrogen	0.19	mg/L	EPA 300	09/27/2005 04:16:00 PM	JL
Nitrogen, Total Kjeldahl	<0.10	mg/L	SM 4500 Norg B	10/04/2005 10:45:00 AM	AS
Oil and Grease	<1.0	mg/L	EPA 1664	10/04/2005 09:00:00 AM	JS
pH	7.50	S.U.	SM4500H+B	09/28/2005 10:30:00 AM	AS
Phosphorus, Total	1.250	mg/L	EPA 365.2	10/04/2005 11:00:00 AM	AS
Total Suspended Solids	1.00	mg/L	EPA 160.2	09/29/2005 10:15:06 AM	LW
Metals					
Copper, Total	<0.01	mg/L	EPA 200.7	10/03/2005 02:16:00 PM	RT
Lead, Total	<0.02	mg/L	EPA 200.7	10/03/2005 02:16:00 PM	RT
Zinc, Total	0.054	mg/L	EPA 200.7	10/03/2005 02:16:00 PM	RT

ACT Number: 2005090266 - 2
Sample Type: Grab
Collected by: Client
Location/ID: Rainfall Ph
Description:

Sample Date: 09/26/2005
Sample Time: 17:00:

Date Received: 09/27/2005
Project number
Sample Matrix: Stormwater

Laboratory Test	**Result**	**Units**	**Method**	**Analysis Date**	**Analyst**

ANALYTICAL CONSULTING TECHNOLOGY, INC

Certified Laboratory

US EPA CT-021
CT PH-0518
EMail actlabs@sbcglobal.net

168 Railroad Hill St., Waterbury, CT 06708 • (203) 757-3960 • Fax (203) 759-2155
www.actlabs.biz

ARCH Chemicals, Inc.
John Lesky, CIH, CSP
350 Knotter Drive
-0-
Cheshire, CT 06410

Report Date: 02/23/2009

ACT Number: 2005090266 - 2
Sample Type: Grab
Collected by: Client
Location/ID: Rainfall Ph
Description:

Sample Date: 09/26/2005
Sample Time: 17:00:

Date Received: 09/27/2005
Project number
Sample Matrix: Stormwater

Laboratory Test	Result	Units	Method	Analysis Date	Analyst
Inorganic					
pH	6.8	S.U.	SM4500H+B	09/26/2005 12:00:00 AM	DG

For Analytical Consulting Technology, Inc. Bertram Frusel
Laboratory Director

2005090266

STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION

December 22, 2005

JOHN LESKY

Arch Chemicals, Incorporated
1200 Lower River Road
P.O. Box 800
Charleston, TN 37310-0800
Attention: William D. Mitchell

RE: Revocation of Stormwater General Permit Number GSI001205 - 350 Knotter Drive - Cheshire, CT

Dear Mr. Mitchell,

Per your request dated November 3, 2005, received by the Bureau of Water Management on November 7, 2005, the Bureau has revoked General Permit Number GSI001205 for Stormwater Discharges at the above referenced site. Bureau records verify that final revocation was logged on December 21, 2005.

Please contact me with questions at (860) 424-3827.

Sincerely,

Donald Gonyea, EA3
Bureau of Water Management

ATTACHMENT D

ECOLOGICAL RECEPTOR EXPOSURE PATHWAY SCOPING CHECKLIST

EPA – New England
Resource Conservation and Recovery Act (RCRA) Corrective Action
Ecological Receptor Exposure Pathway Scoping Checklist

Facility Name: **Arch Chemicals**
Facility Address: **350 Knotter Drive**
Cheshire, Connecticut
Facility EPA ID #: **CTD98016799**

REVIEW OF FACILITY INFORMATION & CONCEPTUAL SITE MODEL

Media Potentially Affected by Facility Operations:	Potential for Migration	Migration Pathways
x Soil	Yes x /No __	UST release; historic drainage recharge
___ Sediment	Yes __/No x	___
x Surface Water	Yes x /No __	Site stormwater; historic drainage
x Ground Water	Yes x /No __	UST release

Facility Information Review and Conceptual Site Model - Rationale and References

ENSR, 2004. Verification Report. Arch Chemicals, Inc., 350 Knotter Drive, Cheshire, Connecticut. March 2004.

ENSR, 2007. Ecological Risk Assessment Work Plan. Arch Chemicals, Inc., 350 Knotter Drive, Cheshire, Connecticut. April 2007.

ENSR, 2008. Ecological Risk Assessment Work Plan Addendum. Arch Chemicals, Inc., 350 Knotter Drive, Cheshire, Connecticut. July 2008.

<u>Facility Information Review</u> (see SERA Workplan, (ENSR, 2007); Section 1.1: pgs 1-1 to 1-3; SERA Workplan Addendum, (ENSR, 2008); Section 2.0 pgs. 2-1 to 2-3; and additional information available in ENSR, 2004)

The facility at 350 Knotter Drive, Cheshire, CT has been used by Arch/Olin since Olin acquired the facility in 1983. The facility was previously occupied by Siemens, a medical equipment manufacturing company, from its construction in 1975 to 1983. Prior to 1975, the Site and surrounding area was under agricultural use. A locus map of the facility and adjoining area is shown on Figure 1 and a site plan provided in Figure 2.

No information is available regarding the specific activities performed by Siemens at the facility during their occupancy. It is expected that activities typical of medical equipment manufacturing companies include: metal working, painting, finishing, parts cleaning, and parts assembly. Chemicals of potential concern (COPCs) associated with these activities include volatile and semi-volatile organic compounds (VOCs and SVOCs), metals, and petroleum hydrocarbons. These COPCs were included for analysis during the Transfer Act investigation, and also will be analyzed for when the proposed surface soil samples are collected.

The facility was originally constructed in 1975 and was originally serviced by a private septic system. This system was located to the east of the facility building. An addition was built onto the southwestern portion of the building during 1980 and 1981 and the facility was connected to the municipal sanitary sewer system in 1981. The facility is serviced by public water, sanitary sewer, electric and natural gas utilities.

Arch/Olin has used the facility as a research and development (R&D) laboratory facility throughout their occupation of the Site. R&D work conducted by Arch/Olin concentrated on swimming pool chemicals, surfactants, liquid toners, urethane compounds, and biocide compounds. Project-specific specialty chemicals (e.g., propellants for explosives) have also been the subjects of R&D at the facility.

Per Connecticut Department of Environmental Protection (CTDEP) and United States Environmental Protection Agency (U.S. EPA) requests, AECOM (formerly ENSR) conducted additional research into the use of propellants for explosives at the Site. According to Arch personnel, hydroxyl ammonia nitrate (HAN), a liquid propellant, and hydrazine, a rocket fuel, were used in very small quantities (lab quantities) at the facility. Current Arch staff is unaware of the exact process in which these chemicals were used, but stated that it was only lab scale work. Any waste generated would have been collected for off-site disposal with other hazardous waste generated at the facility. Both HAN and hydrazine were used at the facility from approximately 1984 until 2005. Note that the facility has been connected to the sanitary sewer since 1981; therefore, no discharges of explosive to the environment are expected to have occurred.

Previous environmental reports for the Site documented the presence of several historical Site features of potential environmental significance that were not related to Arch/Olin site use (see Section 3.0 of the Verification Report (ENSR, 2004) for a summary of previous Site investigations). These include a “test well” and former treatment pits located within the eastern end of the building as well as a leaching pit and a 1,500-gallon underground storage tank (UST) of unknown use located to the east of the building. These features were never used by Arch/Olin and their function is unknown; however, the 1,500-gallon UST was closed in place by Olin in 1983 after it was emptied and cleaned. The contents of the UST were characterized as an ignitable organic and were consequently disposed of as hazardous waste. The 1,500-gallon UST and the leaching pit were both located in the vicinity of the facility’s interim waste storage (IWS) unit, although they are not associated with it in any way.

The facility boilers are fueled by both fuel oil and natural gas. One 20,000-gallon UST containing #2 fuel oil is located east of the site building, near the boiler room. This fuel oil UST was installed in 1993 as a replacement for a similarly sized tank that was installed in 1975. Previous reports (ENSR, 2004) indicated no evidence of spills or stains on the ground surface near the UST fill pipe. Additionally, the UST is equipped with an overspill bucket. According to GZA Geoenvironmental, Inc. (GZA), “light contamination” was encountered in 1993 during the removal of the older fuel oil UST and was cleaned up at that time.

Wastewater from the R&D laboratories is discharged to the sanitary sewer pursuant to a permit. A 10,000-gallon underground diversion tank formerly associated with the lab wastewater discharge is present outside the southeastern side of the building. This tank was disconnected from the sanitary sewer line as part of the facility renovation conducted in 2000. Prior to 2000, in the event of a spill, wastewater could be diverted to the tank to prevent discharge to the sanitary sewer. Arch personnel indicated that there was never a need to use this tank.

Chemical wastes from the R&D laboratories are consolidated into 5 to 55-gallon drums and shipped off-site as hazardous waste. The amount generated by any one lab is small; however, the combined volume of waste produced by the formerly more than eighty on-site R&D laboratories rendered Arch a large quantity generator. Arch formerly operated an interim status hazardous waste storage area located in a small building outside the eastern side of the main building. This unit is no longer in use and a Closure Plan Parts 1 to 3 were submitted to the CTDEP pursuant to RCRA guidance. The result of these submittals was that the IWS achieved clean closure in 2005. A virgin chemical storage room was also located in the southern side of the building. Arch has no record of a spill from this room.

As part of the Site redevelopment, a new <90-day waste storage area was constructed on the west side of the site building and was used by Arch beginning in January 2001. All wastes currently generated on-site are stored in the new <90-day storage area. This entire room is constructed to function as secondary containment. In addition, containment pans are present beneath the drums and containers in the room. An additional secondary containment device used for catching any spills while pouring contents of small containers into larger containers is located in the <90-day storage area. Bulk storage of virgin chemicals is also located in the new less than <90-day storage area. Bench top quantities are used and stored in the laboratories. No staining, cracks or leaks were observed in the <90-day storage area during a 2003 inspection (ENSR, 2004).

A grassy area located to the south of the facility was formerly used as a test area for swimming pool chemicals. The test area consisted of several above ground swimming pools. According to Arch personnel, the pools were used as part of the testing procedure to provide normal biological loading to the water.

GZA Geoenvironmental Inc. (GZA) performed Phase I and Phase II assessments of the facility in 1999 through 2000. GZA reported that chiller condensate and non-contact cooling water were formerly directed to a floor drain in the mechanical room. From 1984 to 1988 this drain discharged water to a drainage ditch located to the southeast of the facility. Approximately 4,000-gallons per day for approximately 150 days per year were discharged to Ten Mile River through this ditch; first under a CT NPDES permit and later as Minor Non-Contact Cooling Water. The water was reported to contain zinc at a concentration of 0.5 mg/L, chlorine, and phosphonate. Floor drains in laboratory areas were sealed when Olin purchased the facility in 1983. GZA evaluated this outfall as part of their Phase II investigations.

AECOM provided CTDEP and U.S. EPA with information regarding stormwater management at the facility (see Section 2.3; ENSR, 2008). Portions of the November 2000 *Stormwater Pollution Prevention Plan* for the Site are included as Attachment 3 of the ERA Workplan Addendum (ENSR, 2008) as well as an “As-Built” Site Plan from 1983 (Attachment 4 of the Addendum). The 1983 Site Plan shows the stormwater drainage areas, stormwater flow patterns and topography for the Site. This plan is expected to reflect the current conditions at the Site, with the exception of the southernmost storm drain, which is no longer present.

A portion of the stormwater runoff from the part of the driveway between Knotter Drive and the parking lot is discharged as overland sheet flow to landscaped areas on either side of the driveway because the driveway is not curbed along this length. The remainder of the runoff from this portion of the driveway is collected in five catch basins. These catch basins discharge via a 24-inch reinforced concrete pipe (RCP) to a grassed swale along Knotter Drive, which in turn discharges to a channel that flows into the detention pond in the northwest corner of the property (i.e., northern detention basin).

The remaining driveways and paved areas surrounding the building to the north, east, and south, as well as the employees/visitor parking area are curbed. Stormwater runoff from the driveways, the loading area, outside drum storage area, the outdoor experimental pools, the dumpsters, and the hazardous waste storage building are directed via the curbing to three catch basins. These three catch basins discharge via a 30-inch RCP to the unnamed stream that flows along the northern edge of the property. This stream receives runoff from the northern detention basin, as well as off-site, upgradient flow from along Knotter Drive, and runoff from the parking lot on the off-site abutting northern property. The outlet from the northern detention basis goes into a channelized stream located at the property boundaries, between the Arch Chemical facility and the adjoining property to the north.

Rainwater from the roof of the building is collected by roof drains and discharge to the same 30-inch RCP which collects and discharges stormwater from the driveways to the north, east and south of the building.

Stormwater runoff from the employee/visitor parking area discharges via one of five paved drainage ditches located along the northern edge of the parking lot to the wooded area, in the direction of the channelized stream outletting the northern detention basin, located along the northern edge of the property. This area is used for parking only. No raw materials, finished products or waste are stored or transported in this area.

A site wide evaluation the facility was required under the Connecticut Transfer Act when the facility was divested from Olin Chemical to Arch Chemical in February of 1999 and a second Transfer Act requirement was triggered when the facility was sold to Winstanley Enterprises (Winstanley) on July 21, 2000. The Transfer Act assessment involved the collection of soil and groundwater samples from areas of concern (AOCs) located throughout the site to evaluate whether the site was in compliance with the Connecticut Remediation Standard Regulation (RSR) or if remediation to achieve RSR compliance would be required. The investigations completed indicated that the site met all applicable RSR soil and groundwater criteria and no remediation was necessary.

On March 30, 2004, ENSR submitted a Verification Report to the CTDEP to bring the investigation and demonstration of compliance with the Connecticut RSR of the facility to regulatory closure. The Verification Report was audited by CTDEP and on August 16, 2004 CTDEP issued a letter indicating that the Verification was acceptable.

The facility formerly contained an Interim Waste Storage (IWS) Unit. Arch operated this regulated unit under "interim status" as provided by 22a-449(c)-105 of the Regulations of Connecticut State Agencies and Section 3005 of RCRA. The IWS Unit was housed in a 575-square foot concrete and metal building with an eight-foot wide double door. The IWS Unit is on the eastern portion of the property. Wastes stored in the IWS Unit consisted of flammable liquids, acids, alkalis, mercury, and hazardous and non-hazardous solid wastes and liquids. The building is still present; however, it was decontaminated and was documented as a clean closure with no release to the environment identified. Public notice for the clean closure was published on August 3, 2005. However, as detailed by CTDEP in August 2006, full RCRA closure also required a (1) drinking water well survey, (2) filing of the Quality Assurance Project Plan (QAPP), and (3) an ecological risk assessment. The ecological risk assessment is the remaining task.

<u>Conceptual Site Model</u>

The Conceptual Site Model (CSM) for the Site summarizes the current knowledge of the Site and ecological resources potentially at risk (see ERA Workplan, Section 2.6 (ENSR, 2007) and ERA Workplan Addendum, Section 3.1 – 3.2; (ENSR, 2008)). The CSM is a set of working hypotheses regarding how ecological receptors at the Site may be exposed to contaminants. The CSM describes the origin, fate, transport, exposure pathways, and receptors of concern. The ecologically important exposure and migration pathways are summarized below with further details in the ERA Workplan and Addendum.

- Metals associated with a suspected historic UST release may be present in the surficial soil and be exposed to terrestrial receptors;

- VOCs and metals in groundwater adjacent to a suspected historic UST release may migrate towards surface water habitat and associated receptors; and

- Chemicals associated with chiller condensate and non-contact cooling water released to the historic drainage ditch in the forested area southeast of the facility may be exposed to terrestrial receptors.

HABITAT DOCUMENTATION

Table 1: Summary of habitats and presence of Site-derived contamination							
Habitat type	**Location**			**Presence of Site-derived contamination**			
	At the site[a]	**Adjacent to the site[b]**	**Not present**	**Con-firmed**	**Sus-pected**	**Not expected**	**Unknown**
MARINE/ESTUARINE ENVIRONMENTS							
Salt marsh			x				
Tidal rivers & streams			x				
Exposed mudflats			x				
Seagrass beds			x				
Rocky shoreline			x				
Other*			x				
FRESHWATER ENVIRONMENTS							
Wetlands		x				x	
Lakes & ponds		x				x	
Rivers and streams		x				x	
Vernal pools[c]		x				x	
Other*			x				
TERRESTRIAL ENVIRONMENTS							
Wooded		x				x	
Transitional		x				x	
Open field	x				x		
Other*			x				

[a] "at the site" is defined as within the limits of the site perimeter or site fence
[b] "adjacent to the site" is more loosely defined as terrestrial or aquatic habitat present in the immediate vicinity of the site
[c] "vernal pool" refers to a temporary body of standing water often located in terrestrial habitat which appears in early spring but completely dries out by late spring-early summer. This type of habitat can be suitable and is critical for, among other things, amphibian reproduction.
* provide additional details.

Habitat Documentation - Rationale and References

ENSR. 2007. Ecological Risk Assessment Work Plan. Arch Chemicals, Inc., 350 Knotter Drive, Cheshire, Connecticut. April 2007.

<u>Excerpted from Section 2.2 from ENSR. 2007.</u>

On March 29, 2007, an AECOM ecologist (Dr. David Mitchell) visited the Arch Chemical facility to conduct a qualitative habitat characterization, identify the on-site ecological habitats and potential receptors, and conduct a qualitative reconnaissance of the adjacent water bodies. This information was used to refine understanding of the Site and to identify whether complete exposure pathways potentially existed. At the time of the visit there was some soil disturbance that appeared to linked to a facility construction project that was underway at the time; however, there is no field evidence of active erosion or groundwater-related releases to off-site areas.

Potential ecological habitats located at or adjacent to the Arch Chemical property included: (1) maintained lawn areas, (2) adjacent upland wooded areas, (3) the Ten Mile River corridor, and (4) two large man-made impoundments. The surrounding ecological habitats appear to be in good condition and providing appropriate ecological functions. Further information on the ecological habitats and associated receptors are described below.

Maintained Lawn Areas

Much of the developed area in the front (west) of the facility consists of open lawn areas consisting of maintained grass interspersed with trees (see Photos #1, #2). This area provides minimal habitat for foraging birds and small mammals and is regularly disturbed. There were considerable number (120+) of Canada geese seen cropping the lawn areas, both on the Arch Chemical property and also on similar lawn areas on adjacent industrial/commercial facilities. Copious amount of goose feces on the soil indicates that these birds have a permanent (i.e., over-wintering) population. Foraging robins were also observed on the lawn areas. On the northern side of the property is a large parking area (see Photo#3).

Upland Wooded Areas

On three sides of the facility, the open lawn areas are bordered by thickets and woods (see Photo #4). On the north side of the property, this vegetation is confined to an approximate 100 ft wide wooded riparian corridor through which a 7-ft wide man-made channel (see Photo #6) (drainage from man-made northern detention basin located in north-northwest corner) flows. The riparian strip acts as a narrow buffer between Arch Chemical property and the industrial property to the north. There is a natural gas pipeline right-of-way (ROW) which angles across the top section of the Arch property. This ROW includes both open lawn areas as well as an open grassed corridor where tree growth has been actively suppressed.

On the south side of the lawn and building footprint, the property are undeveloped shrub thickets grading to saplings and then mature forest. The shrub coverage is not extensive. The shrub areas provide good habitat as they interface between lawn and forest areas. A cottontail rabbit was observed during the March 2007 site visit, as were deer scat and small rodent burrows. Crow, cardinal, robin, and blue jay were identified by sight or call

On the east side of the facility there is mature forest that extends to the Ten Mile River, which is located less than a quarter mile east of the facility building. These areas include uplands (including a nice beech stand), wetlands, and several vernal pools. These areas are expected to have typically forest birds and mammals and support amphibian life. Evidence of deer browse (i.e., cropped branches) was observed on small saplings and shrubs.

Ten Mile River Corridor

The local watershed drainage, including outflow from the two impoundments, goes to the east toward the Ten Mile River (see Photo #8). This waterbody flows in a northeasterly direction until it confluences with the Quinnipiac River in Southington, CT. Near the Arch property, the river is approximately 20 feet wide and appeared to be 2-3 feet deep. There is a distinct floodplain associated with the river, as marked by elevation and the presence of wetland shrubs. The water was clear and flowing and generally free of suspended material. The substrate appears largely sandy and a non-hard substrate. Overhanging vegetation and backwater areas offer potential for fish foraging and refuge. It is not known is there is a coldwater fishery present. Great blue heron tracks were observed on the streambank indicating that this river supports piscivorous wildlife, such as kingfisher, mink, and others.

Impoundments

Two man-made impoundments are located on the Arch Chemical property. One detention basin, approximately 2 acres, is located in the northwestern corner of the Site (see Photo #5). The major inlet for this pond is located at the western end and there was flow from a channel crossing Knotter Drive, where some wetland areas exist. Additional water comes from stormwater inlets or as unorganized overland seepage from adjacent lawn areas. There is no defined outlet structure and the water flows over shallow rocky substrate into the man-made drainage noted above. The shoreline is open and grassed to the waterline for about 2/3 of the periphery. This shoreline was fenced and signage indicated that this was a "*Goose Population Control Area*" – prohibiting feeding of the geese. The outlet area to the east is wooded and there were shrubs and grass near the major inlet. There were six ducks and two geese on the pond, with many other geese observed cropping lawn on next property. It was presumed that the pond maintained a fish population although none were directly observed.

The second impoundment is located in the south of the Arch Property in the drainage from wetland areas located near the gas pipeline ROW and then going southeast towards the Ten Mile River. A man-made impoundment created by an earthen berm approximately 5 feet wide is located in the southeastern portion of the property (see Photo #7). The earthen berm nearest the river is breached and water flows freely out approximately 200 feet into a loop of the Ten Mile River. The western end of the basin has filled in with a *Phragmites* monoculture. The open water area was estimated at approximately 3 acres and appears very shallow. The observable substrate was clayey with much leafy organic material and the water leaving the pond somewhat turbid. Approximately 12 ducks were on the pond during the site visit.

EXPOSURE ASSESSMENT

Surface Water Bodies

Sediments

1 a. Is sediment in surface water bodies known or reasonably expected to be contaminted due to releases at or from the facility? Releases from a facility may include but are not limited to: point source discharges, run-off from contaminated soil, groundwater migration, erosion, filling or aerial deposition resulting from air emissions. **Note: If sediment samples are taken adjacent to or downstream of the site, collection should take place in depositional areas present.**

Yes ___(Complete the remaining questions in this checklist and circle "Yes" in Surface Water Body Finding under the PRELIMINARY ECOLOGICAL RISK EVALUATION Section below.)

No_x__(Proceed to question 1b.)

Surface Water

1b. Is surface water known or reasonably expected to be contaminated due to releases at or from the facility? Releases from a facility may include but are not limited to: point source discharges, run-off from contaminated soil, discharge of contaminated groundwater, groundwater migration or aerial deposition resulting from air emissions. (Note: for surface water, dissolved metal data, from analysis of filtered water samples, is a better indicator of exposure than total metal data).

Yes_ (Complete the remaining questions in this checklist and circle "Yes" in Surface Water Body Finding under the PRELIMINARY ECOLOGICAL RISK EVALUATION Section below.)

No x_ (Proceed to question 1c.)

Groundwater

1 c. For groundwater discharging to surface water, is groundwater, at the point of discharge to the surface water body, known or reasonably suspected to be contaminated due to releases at or from the facility?

Yes ___(Complete the Surface Water Bodies Rationale and References section and the remaining questions in this checklist. Then, circle "Yes" in the Surface Water Body Finding under the PRELIMINARY ECOLOGICAL RISK EVALUATION Section below.)

No_x__(Complete the Surface Water Bodies Rationale and References section directly below, then proceed to the Surface Soil Section below.)

Exposure Assessment - Rationale and References

ENSR. 2004. Verification Report. Arch Chemicals, Inc., 350 Knotter Drive, Cheshire, Connecticut. March 2004.

ENSR. 2007. Ecological Risk Assessment Work Plan. Arch Chemicals, Inc., 350 Knotter Drive, Cheshire, Connecticut. April 2007.

ENSR. 2008. Ecological Risk Assessment Work Plan Addendum. Arch Chemicals, Inc., 350 Knotter Drive, Cheshire, Connecticut. July 2008.

Surface Water Bodies –
As described in the Facility Information review, there are existing direct discharges to surface water other than stormwater. Chiller condensate and non-contact cooling water were released as a permitted discharge from approximately 1984 to 1988; first as a CT NPDES permit for discharge to Ten Mile River and later as Minor Non-Contact Cooling Water. The location of the ditch may be surmised from a 1983 site plan. This was directed towards the southeast but there is no physical evidence that flow from this ditch entered the southern detention basis. There is no identified ditch structure and inspection of the detention basin northern shoreline failed to identify any pipe structure, outlet or depression where such a discharge would have occurred. No delta or sediment accumulation was noted in the inspection of the shoreline area conducted in 2007.

Based on indications on aerial photographs (1992 aerial photo available from Terra Server website at: http://terraserver-usa.com/, it is likely that the drainage ditch was directed southwest towards a forested upland and the flow simply was taken up in local soils and recharged groundwater. The constituents identified by the permit were associated with disinfectant (zinc, chlorine) and boiler scale prevention (phosphonate). Based on the 20 year lapse since discharge, any trace of these constituents would not be present in any of the surface waterbodies adjacent to the facility (i.e., southern detention basin, Ten Mile River)

The only current surface water flows come from episodic stormwater. Approximately 90% of the 75-acre Arch Chemical property is undeveloped landscaped or wooded land. These areas are not used for any manufacturing processes and any rainfall that does not immediately infiltrate during a storm event will accumulate on the land surface or in the wetland areas or routed to the northern detention pond. Most of the stormwater will eventually evaporate or infiltrate into the ground, while a small amount of stormwater will eventually discharge from the northern detention pond via an intermittent stream across the eastern property boundary. The southern basin received no direct stormwater flow from impervious areas at the site.

Accordingly, no sampling of surface water in the detention ponds is proposed since the basins receive tributary flow and stormwater from upgradient areas and impervious surfaces provided by other large facilities in the industrial park. Water and sediment quality in the detention ponds will be a function of the cumulative watershed uses over the last 20 years and also reflect localized sources (e.g., overabundant geese populations).

Sediment Pathway – As described above, there is no current discharge to surface water bodies other than stormwater. The historic drainage ditch apparently went to an upland area and there is no evidence of a sediment delta along the northern shoreline of the southern detention basin. It is surmised that if residue were left from the historic drainage ditch, they would be evident in the soil underlying the former channel. Accordingly, some conformational soil samples are to be taken, but sediments underlying aquatic habitats are assumed not to be impacted.

Groundwater Pathway - While site contaminants were present in groundwater at a few monitoring wells, there is no evidence of any identifiable GW gradient or "plume" at the site (Section 2.5 in ENSR, 2004) that is migrating off-site. Site soil and groundwater exceedances are highly localized and limited in spatial area and vertical extent. Potential fate and transport mechanisms at site do not result in identifiable "areas of site discharge". However, as a conservative measure, in the SLERA groundwater analytical chemistry analysis results from each of the sampling stations will be compared to risk-based surface water screening values. Prior to the screening a dilution and attenuation factor (DAF) of 10 will be applied to account for the reduction in constituents between the groundwater source and discharge to a surface water body.

Surface Soil

2 a. Is surface soil (found at depths of 2 feet or less from the surface) known or reasonably expected to be contaminated due to releases at or from the facility?

Yes x (Proceed to question 2 b.)
No__ (Complete the Surface Soil Rationale and References section and the remaining questions in this checklist, then circle "No" under Surface Soil Finding in the PRELIMINARY ECOLOGICAL RISK EVALUATION Section below.)

2 b. Is all contaminated surface soil covered with buildings, pavement or other physical barriers that prevent plants or wildlife from being exposed to contaminants and that prevent migration of soil contamination into groundwater that could affect a surface water body?

Yes ___(Proceed to question 2 c.)
No_x_ (Complete the Surface Soil Rationale and References section below and the remaining questions in this checklist, then circle "Yes" under Surface Soil Finding in the PRELIMINARY ECOLOGICAL RISK EVALUATION Section below.)

2 c. Is an institutional control in place to ensure the maintenance of the barriers described above so that receptors will not be exposed to contaminated soil (i.e., ensuring that soil will not be exposed as a result of excavation, demolition or other activities and that pavement or other physical barriers will be maintained in good condition and that if soil is exposed, appropriate measures will be taken to address any ecological risks).

Yes ___(After completing the Surface Soil Rationale and References section below and the remaining questions in this checklist, circle "No" under Surface Soil Finding in the PRELIMINARY ECOLOGICAL RISK EVALUATION Section below.)
No_x_ (After completing the Surface Soil Rationale and References section below, and the remaining questions in this checklist, circle "Yes" under Surface Soil Finding in the PRELIMINARY ECOLOGICAL RISK EVALUATION Section below.)

Subsurface Soil

3 a. Is subsurface soil (found at depths greater than 2 feet from the surface) known or reasonably expected to be contaminated due to releases at or from the facility?

Yes _x_(Proceed to question 3 b.)
No___(Skip to the Subsurface Soil Rationale and References section. Then complete the remaining questions in this checklist and circle "No"

under Subsurface Soil Finding in the PRELIMINARY ECOLOGICAL RISK EVALUATION Section below.)

3 b. Are the contaminated subsurface soils located in a setting where they could be exposed by erosion or that subsurface soil contaminants could be mobilized and transported via groundwater to a surface water body?

Yes _x_ (After completing the Subsurface Soil Rationale and References Section and the remaining questions in this checklist, circle "Yes" under Subsurface Soil Finding under the PRELIMINARY ECOLOGICAL RISK EVALUATION Section below).
No___engineering controls are in place. (Proceed to question 3c)

3 c. Is an institutional control in place to effectively ensure that contaminated soil will not be brought to the surface, as a result of excavation, demolition or other activities and, if applicable, to ensure that engineering controls are maintained and that if contaminated soil is exposed, appropriate measures will be taken to address ecological risk?

Yes ___(After completing the Subsurface Soil Rationale and References Section and the remaining questions in this checklist, circle "No" under Subsurface Soil Finding under the PRELIMINARY ECOLOGICAL RISK EVALUATION Section below.)
No_x_ (After completing the Subsurface Soil Rationale and References Section and the remaining questions in this checklist, circle "Yes" under Subsurface Soil Finding under the PRELIMINARY ECOLOGICAL RISK EVALUATION Section below.)

Soil Exposure Assessment – As described above in the Verification Report (ENSR, 2004), the original site releases were light contamination associated with a historic (pre-1993) UST and minor internal drainage. Measured exceedance of media standards (CT RSRs) were confined to a few sub-surface soils and groundwater samples (Tables 1 and 2 in ENSR, 2004). Levels of constituents of concern were low in the sub-surface soils and their groundwater levels continue to decline in subsequent groundwater monitoring efforts (ENSR, 2004).

Due to the UST origin and depth of the light contamination in the sub-surface soils, constituents of interest are not currently exposed to ecological receptors. The area associated with the former UST has been stable and vegetated for many years and there is no potential for sub-surface soils to be exposed in its current state. However, since no engineering controls are in place, it is theoretically possible that sub-surface soils could be excavated. However, the extent and volume of the lightly-contaminated sub-surface soils are small, such that an excavation would mix the lightly-contaminated soil with a much greater volume of soils which show little or no exceedances. Therefore, it is highly unlikely than any risk is posed to terrestrial receptors from this type of activity at the Site.

While it is very unlikely that the current surface soils would be affected by the historic UST release, surface samples will be sampled and evaluated as part of the screening-level ecological risk evaluation (SERA) to confirm there is no adverse risk posed to terrestrial receptors at the site.

In addition, to the UST, there was a historic (pre-1988) discharge of chiller condensate and non-contact cooling water directed to a drainage ditch located to the southeast of the facility in forested areas. Since surface soils could have been affected by the historic discharge, surface samples in the approximate location of the ditch will be sampled and evaluated as part of the SERA to confirm that surface soil have not been impacted.

PRELIMINARY ECOLOGICAL RISK EVALUATION

Surface Water Body Finding:
Based on the information provided above, is further evaluation of risks to ecological receptors from contaminants in surface water or sediments of surface water bodies necessary?

Yes __ (Check "Yes" if the response to any of the questions above regarding Surface Water Bodies is "Yes")

No __x__ (Check "No" if the response to all of the questions above (1a, 1b, and 1c) regarding Surface Water Bodies is "No")

Surface Soil Finding:
Based on the information provided above, is further evaluation of risks to ecological receptors from contaminants in surface soil necessary?

Yes _x_

No ___

Subsurface Soil Finding: Based on the information provided above, is further evaluation of risks to ecological receptors from contaminants in subsurface soil necessary?

Yes ___

No _x__

Based on the information provided on the preceding pages, check the appropriate response:

_____ The answer was "No" for all three of the findings in this checklist (i.e., the Surface Water Body Finding, the Surface Soil Finding and the Subsurface Soil Finding). Therefore, based on the data considered in this checklist, ecological exposure to contaminants at or from the ______________________________ ______________________facility , EPA ID # ___________________ , located at (street address)_________________________________in (town and state) is not reasonably expected and further ecological risk assessment does not appear necessary.

Note: **Releases from the facility must be adequately characterized, in accordance with EPA guidance, in order to make this determination. This checklist should be revisited if new information, that would alter the checklist findings, becomes available. In addition, the finding that ecological exposure to facility contaminants is not expected is not considered final until a site-wide remedy decision made by EPA or a state environmental agency authorized for RCRA Corrective Action results in the termination of interim status of a facility or satisfaction with the conditions of a hazardous waste operating or post-closure permit.**

_x___ The answer was "Yes" for any of the findings in this checklist (i.e., the Surface Water Body Finding, the Surface Soil Finding and the Subsurface Soil Finding). Therefore, further evaluation of ecological risk is recommended for the Arch Chemicals facility, EPA ID #CTD98016799, located at (street address) 350 Knotter Drive in (town and state) Cheshire, Connecticut.

An EPA or state ecological risk assessor should be involved as early as possible in planning the facility investigation. This checklist can be provided to the ecological risk assessor to focus the ecological risk assessment on the potential exposure pathways.

Completed by: (signature) David F. Mitchell

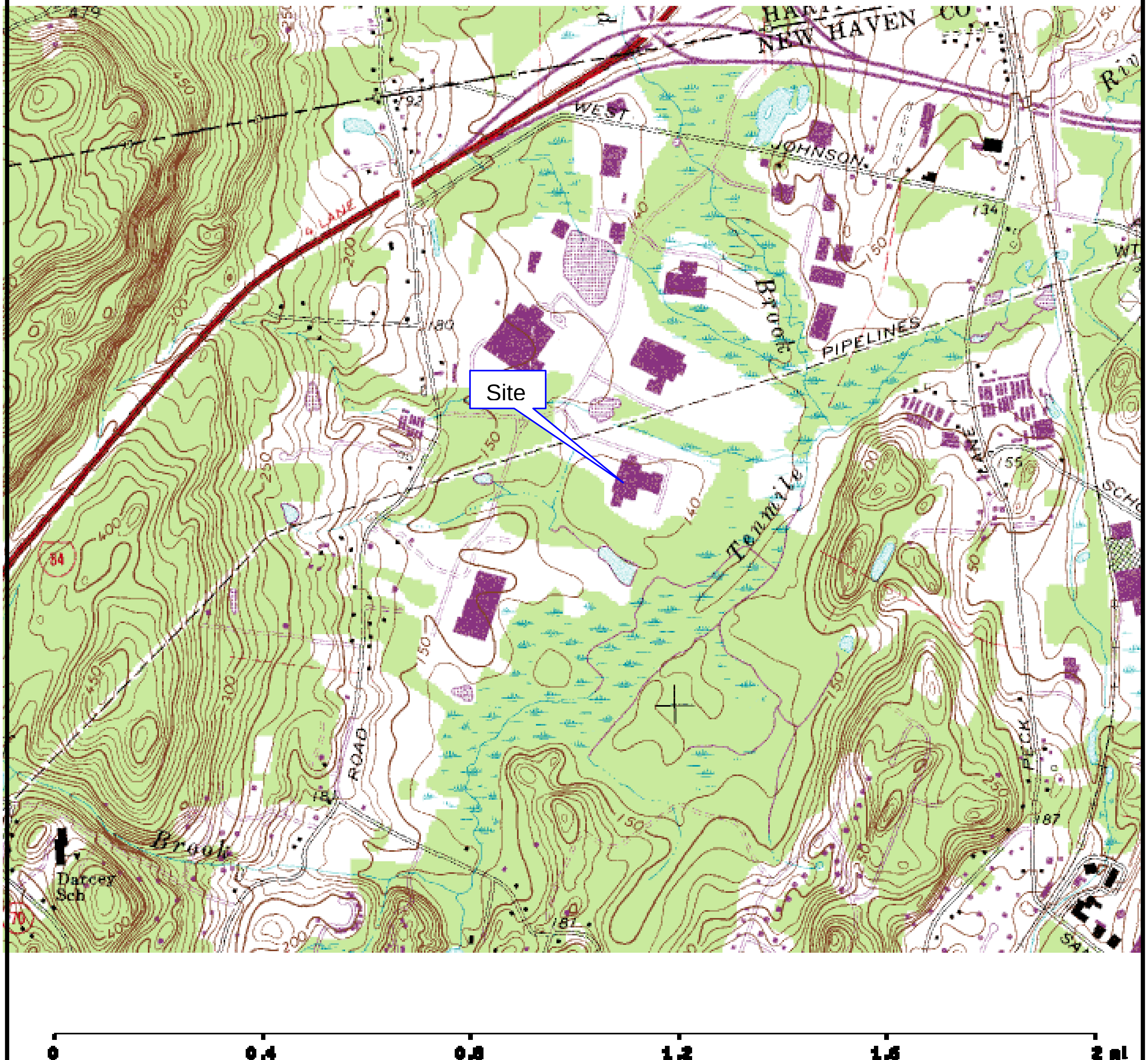
Date: 2/11/09

(printed name) Dr. David Mitchell

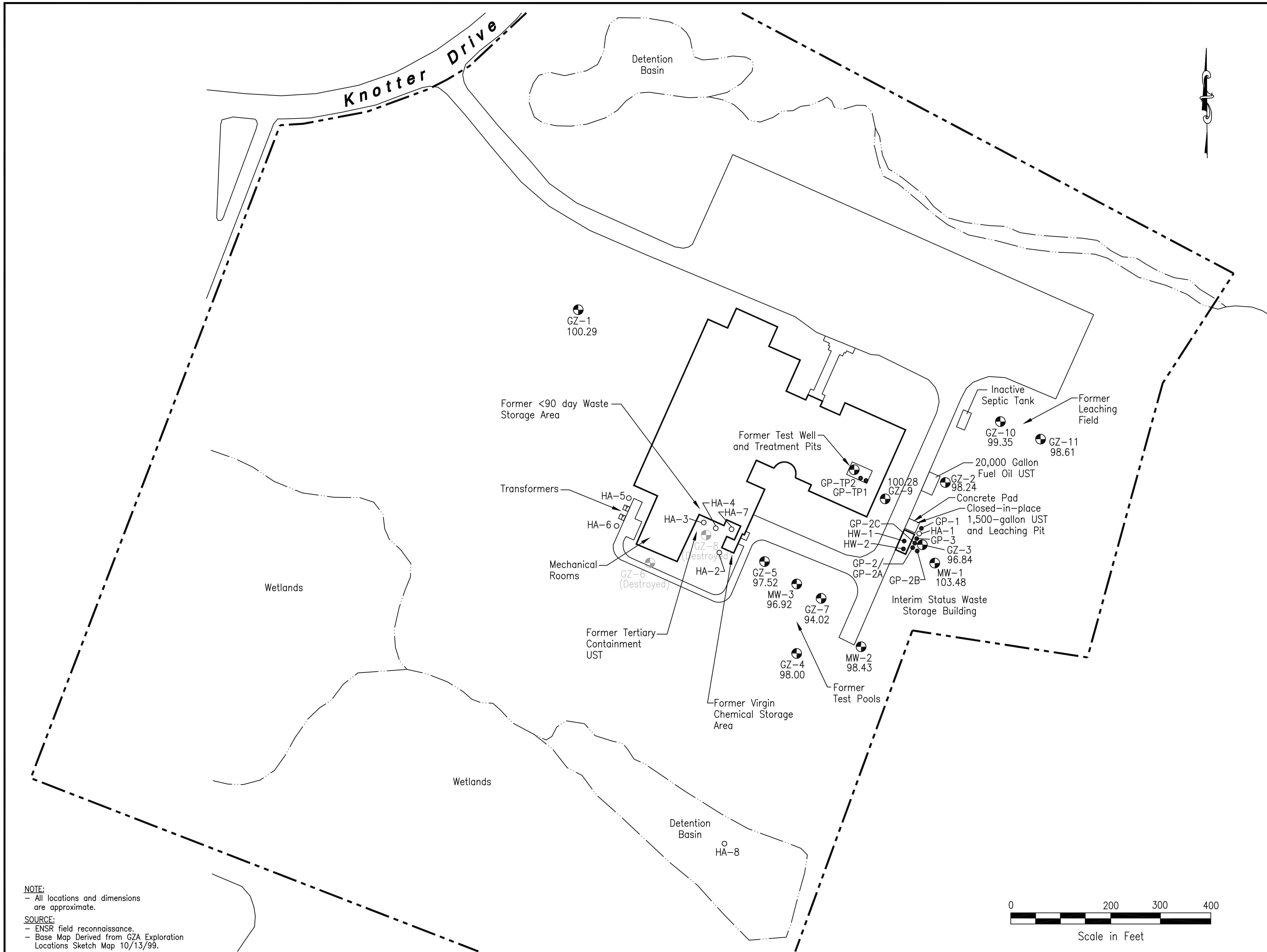
Title: Senior Ecological Risk Assessor

Locations where References may be found:

All referenced documents have been submitted to CTDEP.



	Arch Chemical, Inc. **350 Knotter Drive** **Cheshire, Connecticut**	**Site Locus** Arch Chemical, Inc. 350 Knotter Drive Cheshire, Connecticut April 2007 00489-014	**FIGURE 1** ENSR | AECOM



LEGEND:

— · · —	Approximate Property Boundary
GZ-9 100.28	Monitoring Well/Soil Boring with Well Head Elevation (installed by GZA, 1999)
• GP-1 HW-1	Geoprobe Location
MW-1	Monitoring Well/Soil Boring with Well Head Elevation (installed by ENSR, 2001)
○ HA-1	Shallow Hand Auger Sample

C:\04890SB.DWG

CLIENT

Arch Chemicals, Inc.
1200 River Road
Charleston, Tennessee 37310

PROJECT TITLE

Arch Chemicals, Inc.
350 Knotter Drive
Cheshire, Connecticut

FIGURE TITLE

Site Plan

APPROVED BY	REVIEWED BY
DRAWN BY: G. Moquin	SCALE: 1" = 200'
JOB NUMBER: 0489-004	DATE: February 2004

ENSR
2 Technology Park
Westford, Massachusetts
(978) 589-3000

Figure 2

SHEET

ENSR

SITE PHOTOGRAPHS

1. Front Lawn showing Arch Chemical Facility

2. Front Lawn, Arch Chemical Facility

3. Parking Lot on northern half of property.

4. Representative forested area south of Facility.

5. Northern detention basin, view to northwest.

6. Channelized outlet stream from northern basin.

7. Southern detention basin, view west from breached dam.

8. Ten Mile River, east of Arch Facility.

ATTACHMENT E

RCRA ENVIRONMENTAL INDICATOR FORMS

DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION
RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA725)

Interim Final 2/5/99

Current Human Exposures Under Control

Facility Name: **Arch Chemicals**
Facility Address: **350 Knotter Drive; Cheshire, CT**
Facility EPA ID #: **CTD98016799**

1. Has **all** available relevant/significant information on known and reasonably suspected releases to soil, groundwater, surface water/sediments, and air, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

__x__ If yes - check here and continue with #2 below.

_____ If no - re-evaluate existing data, or

_____ if data are not available skip to #6 and enter "IN" (more information needed) status code.

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Current Human Exposures Under Control" EI

A positive "Current Human Exposures Under Control" EI determination ("YE" status code) indicates that there are no "unacceptable" human exposures to "contamination" (i.e., contaminants in concentrations in excess of appropriate risk-based levels) that can be reasonably expected under current land- and groundwater-use conditions (for all "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Current Human Exposures Under Control" EI are for reasonably expected human exposures under current land- and groundwater-use conditions ONLY, and do not consider potential future land- or groundwater-use conditions or ecological receptors. The RCRA Corrective Action programs overall mission to protect human health and the environment requires that Final remedies address these issues (i.e., potential future human exposure scenarios, future land and groundwater uses, and ecological receptors).

Environmental Indicator (EI) RCRIS code (CA725)
Current Human Exposures Under Control

Duration / Applicability of EI Determinations

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

2. Are groundwater, soil, surface water, sediments, or air **media** known or reasonably suspected to be "**contaminated"**[1] above appropriately protective risk-based 'levels" (applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action (from SWMUs, RUs or AOCs)?

	Yes	No	?	Rationale / Key Contaminants
Groundwater	___	_x_	___	Concentrations below CT RSRs.
Air (indoors) [2]	___	_x_	___	No known plumes below buildings.
Surface Soil (e.g., <2 ft)	___	_x_	___	Concs < CT Residential & mobility RSRs.
Surface Water	___	_x_	___	No known plumes releasing to waterbodies.
Sediment	___	_x_	___	No known plumes releasing to waterbodies.
Subsurf. Soil (e.g., >2 ft)	___	_x_	___	Concs. < CT Residential. & mobility RSRs.
Air (outdoors)	___	_x_	___	No known plumes.

__x__ If no (for all media) - skip to #6, and enter "YE," status code after providing or citing appropriate "levels," and referencing sufficient supporting documentation demonstrating that these "levels" are not exceeded.

_____ If yes (for any media) - continue after identifying key contaminants in each "contaminated" medium, citing appropriate "levels" (or provide an explanation for the determination that the medium could pose an unacceptable risk), and referencing supporting documentation.

_____ If unknown (for any media) - skip to #6 and enter "IN" status code.

Rationale and reference(s):
The following documents have been previously submitted to Connecticut Department of Environmental Protection (CTDEP) and have been used to support the verification of site compliance with prevailing guidelines and CT Remediation Standard Regulations (RSRs).

- GZA, Phase I and Phase II Environmental Site Assessment, November 1999.
- ENSR, Phase III Transfer Act Site Assessment, July 2001.
- ENSR, Quarterly Groundwater Monitoring Reports, July 2001, November 2001, and February 2002.
- ENSR, Additional Subsurface Investigation of the Former Interim Waste Storage Unit, February 2002.
- HRP Associates, Inc., RCRA Closure of Former <90 Day Hazardous Waste Container Storage Area, May 15, 2002.
- ENSR, Limited Dieldrin Investigation Near the Former Interim Waste Storage Unit, December 2003

1 "Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriately protective risk-based "levels" (for the media, that identify risks within the acceptable risk range).

2 Recent evidence (from the Colorado Dept. of Public Health and Environment, and others) suggest that unacceptable indoor air concentrations are more common in structures above groundwater with volatile contaminants than previously believed. This is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration necessary to be reasonably certain that indoor air (in structures located above (and adjacent to) groundwater with volatile contaminants) does not present unacceptable risks.

- ENSR, Verification Report, March 2004.

A site wide evaluation the facility was required under the Connecticut Transfer Act when the facility was divested from Olin Chemical to Arch Chemical in February of 1999 and a second Transfer Act requirement was triggered when the facility was sold to Winstanley Enterprises (Winstanley) on July 21, 2000. The Transfer Act assessment involved the collection of soil and groundwater samples from areas of concern (AOCs) located throughout the site to evaluate whether the site was in compliance with the Connecticut Remediation Standard Regulation (RSR) or if remediation to achieve RSR compliance would be required. The investigations completed indicated that the site met all applicable RSR soil and groundwater criteria with no restrictions to land use and no remediation was necessary.

On March 30, 2004, ENSR submitted a Verification Report to the CTDEP to bring the investigation and demonstration of compliance with the Connecticut RSR of the facility to regulatory closure. The Verification Report was audited by CTDEP and on August 16, 2004 CTDEP issued a letter indicating that the Verification was acceptable.

The facility formerly contained an Interim Waste Storage (IWS) Unit. Arch operated this regulated unit under “interim status” as provided by 22a-449(c)-105 of the Regulations of Connecticut State Agencies and Section 3005 of RCRA. The IWS Unit was housed in a 575-square foot concrete and metal building with an eight-foot wide double door. The IWS Unit is on the eastern portion of the property. Wastes stored in the IWS Unit consisted of flammable liquids, acids, alkalis, mercury, and hazardous and non-hazardous solid wastes and liquids. The building is still present; however, it was decontaminated and was documented as a clean closure with no release to the environment identified. Public notice for the clean closure was published on August 3, 2005. However, as detailed by CTDEP in August 2006, full RCRA closure also required a (1) drinking water well survey, (2) filing of the Quality Assurance Project Plan (QAPP), and (3) an ecological risk assessment. The ecological risk assessment is the remaining task and is currently underway.

The Arch facility is located in the Cheshire Industrial Park in Cheshire, Connecticut. The facility is bordered on three sides by other industrial/commercial properties within the Cheshire Industrial Park and Knotter Drive. The subject site encompasses approximately 75 acres and is occupied by a 144,700 square foot building. The majority of the building is one story in height with small two story sections and is constructed of concrete block on a slab foundation. Approximately 45 acres is occupied by the building footprint, lawns, parking lot and service roads. The balance of the property, approximately 30 acres, is occupied by undeveloped wetlands, ponds, and wooded areas.

The site is located in an area where groundwater is classified by CTDEP as “GB”, indicating that it is considered degraded and is not suitable for human consumption without treatment. The facility is serviced by public water, sanitary sewer, electric and natural gas utilities. Based on information provided by the Chesprocott Health District (serving the towns of Cheshire, Prospect and Wolcott, Connecticut), there are no documented uses of groundwater within the vicinity of the site. No visual evidence of water supply wells were observed during the windshield survey of the properties within approximately 500-feet of the subject property.

As described in the Verification Report (ENSR, 2004), groundwater and soil data collected between 1999 and 2003 show compliance with all applicable RSR criteria for the site. The relatively narrow range of concentrations of metals detected in soil at the site coupled with their widespread distribution at the site indicate that the concentrations detected are background. Nevertheless, the total metals concentrations were compared to 20 times the GB Pollutant Mobility Criteria (GB PMC) in order to see if the concentrations detected could potentially exceed these criteria. Based on this comparison it was observed that lead and chromium could potentially exceed their respective GB PMCs. As a result, soil samples with levels of lead and chromium in excess of 20 times the GB PMC were submitted for synthetic precipitation leaching procedure (SPLP) extraction and analysis. The results for these samples were below detection limits for both metals. Therefore the Verification Report (ENSR, 2004) concluded that compliance with the GB PMC has been demonstrated for all metals detected at the site.

In groundwater, 1,1-dichloroethene and chloroform are the only volatile organic compounds (VOCs) that have ever shown an exceedance of an RSR criteria at the site. Both of these compounds exceeded the residential volatilization criteria (RVC) in the October 1999 sampling round in only one AOC but were below the industrial/commercial volatilization criteria (I/C VC). In all subsequent sampling rounds neither of these compounds exceeded the RVC. Lead and cadmium exceeded the Surface Water Protection Criteria (SWPC) in the GZA sampling rounds. These samples were collected using bailers, which produce a silty sample. Four subsequent rounds collected by low flow techniques did not detect either metal. Cadmium exceeded the SWPC in February 2002 in a monitoring well located downgradient from the former swimming pool chemical test pools (GZ-7). This metal had not been detected previously in this well in five prior rounds. Since there is a well downgradient of GZ-7 in which cadmium has not been detected in four sampling rounds, the SWPC does not apply to the GZ-7 cadmium data from February 2002. The Verification Report (ENSR, 2004) concluded that compliance with RSR criteria for groundwater at the site had been demonstrated and that remediation was not necessary.

Site investigations have not identified evidence of VOCs in groundwater or soil that would be expected to be found in air. In addition, investigations have not identified a mobile plume that could impact surface water or sediment. Therefore, concentrations of soil, groundwater, surface soil and air are expected to be below appropriately protective risk-based ‘levels” for human health exposure.

Environmental Indicator (EI) RCRIS code (CA725)
Current Human Exposures Under Control

3. Are there **complete pathways** between “contamination” and human receptors such that exposures can be reasonably expected under the current (land- and groundwater-use) conditions?

Summary Exposure Pathway Evaluation Table

Potential **Human Receptors** (Under Current Conditions)

“Contaminated” Media	Residents	Workers	Day-Care	Construction	Trespassers	Recreation	Food[3]
Groundwater	___	___	___	___			___
Air (indoors)	___	___	___				
Soil (surface, e.g., <2 ft)	___	___	___	___	___	___	___
Surface Water	___	___			___	___	___
Sediment	___	___			___	___	___
Soil (subsurface e.g., >2 ft)				___			___
Air (outdoors)	___	___	___	___	___		

Instructions for Summary Exposure Pathway Evaluation Table:

1. Strike-out specific Media including Human Receptors spaces for Media which are not “contaminated”) as identified in #2 above.

2. enter “yes” or “no” for potential “completeness” under each “Contaminated” Media -- Human Receptor combination (Pathway).

Note: In order to focus the evaluation to the most probable combinations some potential “Contaminated” Media - Human Receptor combinations (Pathways) do not have check spaces (“___”). While these combinations may not be probable in most situations they may be possible in some settings and should be added as necessary.

_____ If no (pathways are not complete for any contaminated media-receptor combination) - skip to #6, and enter “YE” status code, after explaining and/or referencing condition(s) in-place, whether natural or man-made, preventing a complete exposure pathway from each contaminated medium (e.g., use optional Pathway Evaluation Work Sheet to analyze major pathways).

_____ If yes (pathways are complete for any “Contaminated” Media - Human Receptor combination) - continue after providing supporting explanation.

_____ If unknown (for any “Contaminated” Media - Human Receptor combination) - skip to #6 and enter “IN” status code

Rationale and Reference(s):

3 Indirect Pathway/Receptor (e.g., vegetables, fruits, crops, meat and dairy products, fish, shellfish, etc.)

4 Can the **exposures** from any of the complete pathways identified in #3 be reasonably expected to be **"significant"**[4] (i.e., potentially "unacceptable" because exposures can be reasonably expected to be: 1) greater in magnitude (intensity, frequency and/or duration) than assumed in the derivation of the acceptable "levels" (used to identify the "contamination"); or 2) the combination of exposure magnitude (perhaps even though low) and contaminant concentrations (which may be substantially above the acceptable "levels") could result in greater than acceptable risks)?

_____ If no (exposures can not be reasonably expected to be significant (i.e., potentially "unacceptable") for any complete exposure pathway) - skip to #6 and enter "YE" status code after explaining and/or referencing documentation justifying why the exposures (from each of the complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

_____ If yes (exposures could be reasonably expected to be "significant" (i.e., potentially "unacceptable") for any complete exposure pathway) - continue after providing a description (of each potentially "unacceptable" exposure pathway) and explaining and/or referencing documentation justifying why the exposures (from each of the remaining complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

_____ If unknown (for any complete pathway) - skip to #6 and enter "IN" status code

Rationale and Reference(s):

5. Can the "significant" **exposures** (identified in #4) be shown to be within **acceptable** limits?

_____ If yes (all "significant" exposures have been shown to be within acceptable limits) - continue and enter "YE" after summarizing and referencing documentation justifying why all "significant" exposures to "contamination" are within acceptable limits (e.g., a site-specific Human Health Risk Assessment).

_____ If no (there are current exposures that can be reasonably expected to be "unacceptable")- continue and enter "NO" status code after providing a description of each potentially "unacceptable" exposure.

_____ If unknown (for any potentially "unacceptable" exposure) - continue and enter "IN" status code

Rationale and Reference(s):

4 If there is any question on whether the identified exposures are "significant"(i.e., potentially "unacceptable") consult a human health Risk Assessment specialist with appropriate education, training and experience.

Environmental Indicator (EI) RCRIS code (CA725)
Current Human Exposures Under Control

6. Check the appropriate RCRIS status codes for the Current Human Exposures Under Control EI event code (CA725), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (and attach appropriate supporting documentation as well as a map of the facility):

_x__ YE - Yes, 'Current Human Exposures Under Control" has been verified. Based on a review of the information contained in this EI Determination, "Current Human Exposures" are expected to be "Under Control" at the Arch Chemical facility, EPA ID # CTD98016799, located at 350 Knotter Drive; Cheshire, CT under current and reasonably expected conditions. This determination will be re-evaluated when the Agency/State becomes aware of significant changes at the facility.

____ NO - "Current Human Exposures" are NOT "Under Control."

____ IN - More information is needed to make a determination.

Completed by (signature)______________________________ Date _____________
print)______________________________
(title)______________________________

Supervisor (signature)______________________________ Date _____________
(print)______________________________
(title)______________________________
(EPA Region or State)____________________

Locations where References may be found:
All references have been submitted to CT DEP located at 79 Elm Street in Hartford, CT.

Contact telephone and e-mail numbers
(name)______________________________
(phone #)______________________________
(e-mail)______________________________

FINAL NOTE: THE HUMAN EXPOSURES EI IS A QUALITATIVE SCREENING OF EXPOSURES AND THE DETERMINATIONS WITHIN THIS DOCUMENT SHOULD NOT BE USED AS THE SOLE BASIS FOR RESTRICTING THE SCOPE OF MORE DETAILED (E.G., SITE-SPECIFIC) ASSESSMENTS OF RISK.

DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION
RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA750)

Interim Final 2/5/99

Migration of Contaminated Groundwater Under Control

Facility Name: **Arch Chemicals____**
Facility Address: **350 Knotter Drive; Cheshire, CT__________________________**
Facility EPA ID #: **CTD98016799____**

1. Has **all** available relevant/significant information on known and reasonably suspected releases to the groundwater media, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

   _x___ If yes - check here and continue with #2 below.

   _____ If no - re-evaluate existing data, or

   _____ if data are not available, skip to #8 and enter "IN" (more information needed) status code.

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Migration of Contaminated Groundwater Under Control" EI

A positive "Migration of Contaminated Groundwater Under Control" EI determination ("YE" status code) indicates that the migration of "contaminated" groundwater has stabilized, and that monitoring will be conducted to confirm that contaminated groundwater remains within the original "area of contaminated groundwater" (for all groundwater "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Migration of Contaminated Groundwater Under Control" EI pertains ONLY to the physical migration (i.e., further spread) of contaminated ground water and contaminants within groundwater (e.g., non-aqueous phase liquids or NAPLs). Achieving this EI does not substitute for achieving other stabilization or final remedy requirements and expectations associated with sources of contamination and the need to restore, wherever practicable, contaminated groundwater to be suitable for its designated current and future uses.

Duration / Applicability of EI Determinations

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

Environmental Indicator (EI) RCRIS code (CA750)
Migration of Contaminated Groundwater Under Control

2. Is **groundwater** known or reasonably suspected to be **"contaminated"**[1] above appropriately protective "levels" (i.e., applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action, anywhere at, or from, the facility?

_____ If yes - continue after identifying key contaminants, citing appropriate "levels," and referencing supporting documentation.

__x__ If no - skip to #8 and enter "YE" status code, after citing appropriate "levels," and referencing supporting documentation to demonstrate that groundwater is not "contaminated."

_____ If unknown - skip to #8 and enter "IN" status code.

Rationale and Reference(s):

The following documents have been previously submitted to Connecticut Department of Environmental Protection (CTDEP) and have been used to support the verification of site compliance with prevailing guidelines and CT Remediation Standard Regulations (RSRs).

- GZA, Phase I and Phase II Environmental Site Assessment, November 1999.
- ENSR, Phase III Transfer Act Site Assessment, July 2001.
- ENSR, Quarterly Groundwater Monitoring Reports, July 2001, November 2001, and February 2002.
- ENSR, Additional Subsurface Investigation of the Former Interim Waste Storage Unit, February 2002.
- HRP Associates, Inc., RCRA Closure of Former <90 Day Hazardous Waste Container Storage Area, May 15, 2002.
- ENSR, Limited Dieldrin Investigation Near the Former Interim Waste Storage Unit, December 2003
- ENSR, Verification Report, March 2004.

A site wide evaluation the facility was required under the Connecticut Transfer Act when the facility was divested from Olin Chemical to Arch Chemical in February of 1999 and a second Transfer Act requirement was triggered when the facility was sold to Winstanley Enterprises (Winstanley) on July 21, 2000. The Transfer Act assessment involved the collection of soil and groundwater samples from areas of concern (AOCs) located throughout the site to evaluate whether the site was in compliance with the Connecticut Remediation Standard Regulation (RSR) or if remediation to achieve RSR compliance would be required. The investigations completed indicated that the site met all applicable RSR soil and groundwater criteria and no remediation was necessary.

On March 30, 2004, ENSR submitted a Verification Report to the CTDEP to bring the investigation and demonstration of compliance with the Connecticut RSR of the facility to regulatory closure. The Verification Report was audited by CTDEP and on August 16, 2004 CTDEP issued a letter indicating that the Verification was acceptable.

The facility formerly contained an Interim Waste Storage (IWS) Unit. Arch operated this regulated unit under "interim status" as provided by 22a-449(c)-105 of the Regulations of Connecticut State Agencies and Section 3005 of RCRA. The IWS Unit was housed in a 575-square foot concrete and metal building with an eight-foot wide double door. The IWS Unit is on the eastern portion of the property. Wastes stored in

1 "Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriate "levels" (appropriate for the protection of the groundwater resource and its beneficial uses).

the IWS Unit consisted of flammable liquids, acids, alkalis, mercury, and hazardous and non-hazardous solid wastes and liquids. The building is still present; however, it was decontaminated and was documented as a clean closure with no release to the environment identified. Public notice for the clean closure was published on August 3, 2005. However, as detailed by CTDEP in August 2006, full RCRA closure also required a (1) drinking water well survey, (2) filing of the Quality Assurance Project Plan (QAPP), and (3) an ecological risk assessment. The ecological risk assessment is the remaining task and is currently underway.

The site is set in a valley area at an elevation of approximately 150 feet above mean sea level). Subsurface investigations have demonstrated that the site is underlain by interbedded fine sand, silt, and clay which in turn is underlain by silt and clay at a depth of approximately 10 to 14 feet. These observations are consistent with the regional Surficial Geologic Materials Map of Connecticut that describes the surface deposits beneath the site as composed of well sorted thin layers of alternating silt and clay or thicker layers of very fine sand and silt. Very fine sand commonly occurs at the surface and grades downward into rhythmically bedded silt and clay varves (lake-bottom deposits). The bedrock beneath the site is mapped as the New Haven Arkose. Bedrock refusal was not encountered on site, nor have any bedrock outcrops been identified on the site.

The site is located in an area where groundwater is classified by CTDEP as “GB”, indicating that it is considered degraded and is not suitable for human consumption without treatment. The surficial geology on-site is consistent with this designation as the water yielding properties of the deposits observed and mapped are poor.

While site contaminants were present in groundwater at a few monitoring wells, there is no evidence of any identifiable groundwater gradient or “plume” at the site that is migrating off-site. Site soil and groundwater exceedances are highly localized and limited in spatial area and vertical extent. Potential fate and transport mechanisms at site do not result in identifiable “areas of site discharge.”

As described in the Verification Report (ENSR, 2004), groundwater and soil data collected between 1999 and 2003 show compliance with all applicable RSR criteria for the site. In groundwater, 1,1-dichloroethene and chloroform are the only volatile organic compounds (VOCs) that have ever shown an exceedance of an RSR criteria at the site. Both of these compounds exceeded the residential volatilization criteria (RVC) in the October 1999 sampling round in only one AOC but were below the industrial/commercial volatilization criteria (I/C VC). In all subsequent sampling rounds neither of these compounds exceeded the RVC. Lead and cadmium exceeded the Surface Water Protection Criteria (SWPC) in the GZA sampling rounds. These samples were collected using bailers, which produce a silty sample. Four subsequent rounds collected by low flow techniques did not detect either metal. Cadmium exceeded the SWPC in February 2002 in a monitoring well located downgradient from the former swimming pool chemical test pools (GZ-7). This metal had not been detected previously in this well in five prior rounds. Since there is a well downgradient of GZ-7 in which cadmium has not been detected in four sampling rounds, the SWPC does not apply to the GZ-7 cadmium data from February 2002. The Verification Report (ENSR, 2004) concluded that compliance with RSR criteria for groundwater at the site had been demonstrated and that remediation was not necessary.

Based on the investigations performed, the distribution of contaminants found in groundwater at the site indicate that the closed in place 1,500-gallon underground storage tank (UST) and/or leaching pit used by Siemens are likely the source of contamination observed in the monitoring well located downgradient from interim waste storage (IWS) unit, abandoned 1,500-gallon UST and former leaching pit (GZ-3) and landscaping activities and/or historic agricultural use are the likely source of the pesticides (i.e., dieldrin) observed in the soil near the IWS However, the investigations completed by both GZA and ENSR indicate that no remediation is required relative to these historic features since the investigation of this area has been thorough and RSR criteria are met in soil and groundwater.

3. Has the **migration** of contaminated groundwater **stabilized** (such that contaminated groundwater is expected to remain within "existing area of contaminated groundwater"[2] as defined by the monitoring locations designated at the time of this determination)?

_____ If yes - continue, after presenting or referencing the physical evidence (e.g., groundwater sampling/measurement/migration barrier data) and rationale why contaminated groundwater is expected to remain within the (horizontal or vertical) dimensions of the "existing area of groundwater contamination"[2]).

_____ If no (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the "existing area of groundwater contamination"2) - skip to #8 and enter "NO" status code, after providing an explanation.

_____ If unknown - skip to #8 and enter "IN" status code.

Rationale and Reference(s):

4. Does "contaminated" groundwater **discharge** into **surface water** bodies?

_____ If yes - continue after identifying potentially affected surface water bodies.

_____ If no - skip to #7 (and enter a "YE" status code in #8, if #7 = yes) after providing an explanation and/or referencing documentation supporting that groundwater "contamination" does not enter surface water bodies.

_____ If unknown - skip to #8 and enter "IN" status code.

Rationale and Reference(s):

2 "existing area of contaminated groundwater" is an area (with horizontal and vertical dimensions) that has been verifiably demonstrated to contain all relevant groundwater contamination for this determination, and is defined by designated (monitoring) locations proximate to the outer perimeter of "contamination" that can and will be sampled/tested in the future to physically verify that all "contaminated" groundwater remains within this area, and that the further migration of "contaminated" groundwater is not occurring. Reasonable allowances in the proximity of the monitoring locations are permissible to incorporate formal remedy decisions (i.e., including public participation) allowing a limited area for natural attenuation.

5. Is the **discharge** of "contaminated" groundwater into surface water likely to be **"insignificant"** (i.e., the maximum concentration[3] of each contaminant discharging into surface water is less than 10 times their appropriate groundwater "level," and there are no other conditions (e.g., the nature, and number, of discharging contaminants, or environmental setting), which significantly increase the potential for unacceptable impacts to surface water, sediments, or eco-systems at these concentrations)?

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_____ If yes - skip to #7 (and enter "YE" status code in #8 if #7 = yes), after documenting: 1) the maximum known or reasonably suspected concentration [3] of <u>key</u> contaminants discharged above their groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) provide a statement of professional judgement/explanation (or reference documentation) supporting that the discharge of groundwater contaminants into the surface water is not anticipated to have unacceptable impacts to the receiving surface water, sediments, or eco-system.

_____ If no - (the discharge of "contaminated" groundwater into surface water is potentially significant) - continue after documenting: 1) the maximum known or reasonably suspected concentration[3] of <u>each</u> contaminant discharged above its groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) for any contaminants discharging into surface water in concentrations[3] greater than 100 times their appropriate groundwater "levels," the estimated total amount (mass in kg/yr) of each of these contaminants that are being discharged (loaded) into the surface water body (at the time of the determination), and identify if there is evidence that the amount of discharging contaminants is increasing.

_____ If unknown - enter "IN" status code in #8.

Rationale and Reference(s):

6. Can the **discharge** of "contaminated" groundwater into surface water be shown to be "**currently acceptable**" (i.e., not cause impacts to surface water, sediments or eco-systems that should not be allowed to continue until a final remedy decision can be made and implemented[4])?

_____ If yes - continue after either: 1) identifying the Final Remedy decision incorporating these conditions, or other site-specific criteria (developed for the protection of the site=s surface water, sediments, and eco-systems), and referencing supporting documentation demonstrating that these criteria are not exceeded by the discharging groundwater; OR 2) providing or referencing an interim-assessment,[5] appropriate to the potential for

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3 As measured in groundwater prior to entry to the groundwater-surface water/sediment interaction (e.g., hyporheic) zone.

4 Note, because areas of inflowing groundwater can be critical habitats (e.g., nurseries or thermal refugia) for many species, appropriate specialist (e.g., ecologist) should be included in management decisions that could eliminate these areas by significantly altering or reversing groundwater flow pathways near surface water bodies.

5 The understanding of the impacts of contaminated groundwater discharges into surface water bodies is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration to be reasonably certain that discharges are not causing currently unacceptable impacts to the surface waters, sediments or eco-systems.

impact, that shows the discharge of groundwater contaminants into the surface water is (in the opinion of a trained specialists, including ecologist) adequately protective of receiving surface water, sediments, and eco-systems, until such time when a full assessment and final remedy decision can be made. Factors which should be considered in the interim-assessment (where appropriate to help identify the impact associated with discharging groundwater) include: surface water body size, flow, use/classification/habitats and contaminant loading limits, other sources of surface water/sediment contamination, surface water and sediment sample results and comparisons to available and appropriate surface water and sediment "levels," as well as any other factors, such as effects on ecological receptors (e.g., via bio-assays/benthic surveys or site-specific ecological Risk Assessments), that the overseeing regulatory agency would deem appropriate for making the EI determination.

_____ If no - (the discharge of "contaminated" groundwater can not be shown to be "**currently acceptable**") - skip to #8 and enter "NO" status code, after documenting the currently unacceptable impacts to the surface water body, sediments, and/or eco-systems.

_____ If unknown - skip to 8 and enter "IN" status code.

Rationale and Reference(s):

7. Will groundwater **monitoring** / measurement data (and surface water/sediment/ecological data, as necessary) be collected in the future to verify that contaminated groundwater has remained within the horizontal (or vertical, as necessary) dimensions of the "existing area of contaminated groundwater?"

_____ If yes - continue after providing or citing documentation for planned activities or future sampling/measurement events. Specifically identify the well/measurement locations which will be tested in the future to verify the expectation (identified in #3) that groundwater contamination will not be migrating horizontally (or vertically, as necessary) beyond the "existing area of groundwater contamination."

_____ If no - enter "NO" status code in #8.

_____ If unknown - enter "IN" status code in #8.

Rationale and Reference(s):

Environmental Indicator (EI) RCRIS code (CA750)
Migration of Contaminated Groundwater Under Control

8. Check the appropriate RCRIS status codes for the Migration of Contaminated Groundwater Under Control EI (event code CA750), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (attach appropriate supporting documentation as well as a map of the facility).

__x__ YE - Yes, "Migration of Contaminated Groundwater Under Control" has been verified. Based on a review of the information contained in this EI determination, it has been determined that the "Migration of Contaminated Groundwater" is "Under Control" at the _Arch Chemicals facility , EPA ID # CTD98016799, located at 350 Knotter Drive in Cheshire, CT. Specifically, this determination indicates that the migration of "contaminated" groundwater is under control, and that monitoring will be conducted to confirm that contaminated groundwater remains within the "existing area of contaminated groundwater. This determination will be re-evaluated when the Agency becomes aware of significant changes at the facility.

_____ NO - Unacceptable migration of contaminated groundwater is observed or expected.

_____ IN - More information is needed to make a determination.

Completed by (signature)______________________________ Date _____________
print)________________________________
(title)________________________________

Supervisor (signature)______________________________ Date _____________
(print)________________________________
(title)________________________________
(EPA Region or State)____________________

Locations where References may be found:
All references have been submitted to CT DEP located at 79 Elm Street in Hartford, CT.

Contact telephone and e-mail numbers

(name)________________________________
(phone #)______________________________
(e-mail)________________________________